



This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

- + *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.
- + *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.
- + *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.
- + *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at <http://books.google.com/>

Med 5019.07.5



Harvard College Library

FROM

Ledyard W. Sargent

THE CARE OF THE BODY



THE CARE OF THE BODY

BY
FRANCIS CAVANAGH, M.D. (EDIN.)

NEW YORK
E. P. DUTTON AND COMPANY
31 WEST TWENTY-THIRD STREET

1907

Med 5019.07.5
✓



Edward Worthington Sargent

PREFACE

THE assumption is made, as much in the professional medical curriculum as in the life of the ordinary citizen, that there is a universal comprehension of all those matters which make up the commonplaces of existence. It is our British habit to assume with equally indifferent justification that every Briton knows the Law. But though knowledge of neither the law of the land nor the laws of nature is necessary to the individual who follows these, however blindly, the day is passing when a conscious hygiene can be ignored. Man's inhumanity to himself, induced by too great attention to inessentials, has caused the need. More and more he has allowed his sleep, his clothing, his exercise to be moulded into the forms and times which other faculties have called convenient: light is light whatever its source, and to be used unquestioningly, since it is only "natural" for eyes to see! With an easy optimism, it has been assumed that short of actual dazzling or deafening there is little need to study the work that harasses our organs of principal sense. In the following pages an attempt is made to show how, first of all, in caring for the body it is needful to examine our daily ways. On account of the variety of the subjects—a variety which precludes any definite sequence from chapter to chapter—no logical order is

possible ; but loosely strung as they are it is hoped that the thread of practical hygiene which connects them while it extenuates the form, will account for the writing and possibly even justify their being read.

F. C.

SHEFFIELD

CONTENTS

CHAPTER I

	PAGE
MOTIVE OF BOOK	I

The healthy body undefinable—Why?—Normal expectation of life according to Metchnikoff—Assurance methods—Human life dependent on environment—Complication introduced by volition—Principal remaining antagonist to longevity is bacterial—Disease so far as it is bacterial only occasionally eradicable—Malaria as example of eradicable disease—The “intermediate host” explaining this—Tuberculosis in its various forms, different from malaria, cannot be so quickly attacked through its micro-organism—Attention directed, therefore, to the condition of “unfitness” that may be amended—Bacillary history of value in suggesting precautions—Simplest immunity is bodily fitness—Condition of “Phagocytes” depends upon condition of body—Condition of body is affected by sleep, exercise, habits, &c.

CHAPTER II

SLEEP	9
-----------------	---

Introductory consideration of dreams—Sleep and rhythm—“Law of Dissolution”—Attention and judgment always awake save during sleep—Fatigue is a brain state—The ergograph—Changes in brain cells caused by functioning—Reintegration of brain cells requires anæmia—Effects of any stimulus upon cerebral circulation—Hypnotists, mesmerists, and Indian hill-thieves compared—The effects of hyperæmia—Oliver Wendell Holmes—Sleeping over a question—Dreams and insomnia—Visual cells most worked—Hallucinations, ghosts, &c.—Psychical research—Hamlet and Macbeth.

Duration and Time of Sleep. The infant, adult, school-boy—Neurotic sleep—Extra time needed by women—And by every one

at various critical periods—Exceptional cases—Bed-time—Continuous sleep is peculiar to man—The “Vital Tides”—Ten till seven the best time—Why not twenty minutes every hour?

The Bedroom.—Semi-asphyxiated sleep—The open window—Size of room—Night air fallacy—Effect of light—Furniture—Colour of walls—No straight angles—Polished floor—Position of bed.

Bed-furniture.—Mattress, sheets, &c.

Bed.—Length—Width—“Tucking-in” of clothes—“Airing.”

Methods of wooing sleep—Warm bath usually the best—Position of sleeping—Position and deformity—Dangers of insomnia.

Cervantes on sleep—“Tired nature’s sweet restorer.”

CHAPTER III

BATHS

36

All-the-year-round bathers.

The Cold Bath.—Is not universally suitable—Not a cleanser—Proper employment and its physiological virtues explained—Its value is usually in inverse ratio to its length—Why the skin must be washed—Fifty ounces of perspiration daily—Skin well protected by keratin and the shape of gland channels—Sebaceous openings are the vulnerable points—Skin-gilding fable—Loss of heat from skin at different temperatures of bath—Sebum chiefly necessitates cleanliness—Friction.

The Warm Bath.

Variations on Hot and Cold Baths.—Douche—Sponging—Shower—Needle, &c.—Turkish baths—Warning.

Suggestion for School Children.

Bathing.—The secret of salt water analysed—Time for bathing—Duration—Nothing occult in sea-water to prevent colds.

Medicated Baths.—Dr. Johnson’s opinion—Radium—Electricity—Dust—Sand—Mud—Peat—All act by friction.

The Common Cold investigated—The omnipresence of harmful micro-organisms—The ordinary condition of the body is a balance between attack and defence—Where colds arise—The bacilli concerned—Quinine.

CHAPTER IV

EXERCISE, TRAINING, AND ATHLETICS

53

Norse and Greek physical worship—Physiology reconciles mind and body—Archdall Reid and development by exercise—Baby and amoeba compared—The “fidgetiness” of children a physiological

CONTENTS

ix

PAGE

necessity—From seven till puberty boy and girl equal—Precaution at puberty—Athletic and intellectual women *iusus natura*.

The basis of all exercise—"Going back to Nature"—Development of human locomotion—The other muscles affected—Free respiration essential.

Need of exercise shown from the food consumed—The instinct of "hunger" fallacy—The pathology of "John Bull" and Pickwick—A walk of eighteen miles—A housewife's exercise—Failure to build a reserve—The need and definition of the proper reserve of strength.

Training.—Temporary training is folly—Grecian athletes—Their diet, exercise, and death—Professional and amateur—Ordinary training—Training-off—If no "training-off" a waste of time and a danger—Staleness—Training is a lifelong matter—A wrinkle from America and Galen.

Methods of Exercise.—Walking—Town air no excuse for staying indoors—Games are as natural as walking—Ball-games founded in our development—Football—Team play—Muscular systems and not individual muscles the test of any sport or game—Women must matc with women—Gymnastics better than bedroom athletics—"Second wind" and "stitch"—Summary.

CHAPTER V

FATIGUE AND MASSAGE 86

Death due to the cumulative action of fatigue products—Blood of tired animals is poisonous—A man is as old as his arteries—Fatigue, strain, and alcohol—Atrophy—Fatigue can never be eliminated—Essential to consciousness—The absence of fatigue in movements is accompanied by a loss in attention—Life must always be difficult to the thinker—Seat of fatigue is the brain—Folly of change of occupation as a cure of actual fatigue—Rest—How emotion overcomes fatigue—Sleep—Coffee, tea, cocoa, alcohol—Neurasthenia and insanity the penalty of too great an ignoring of fatigue.

Massage.—Homer and Herodicus—Imitates the squeezing action of muscles—Anatripsiis—Gentle rubbing stimulates growth—Vigorous rubbing—Beauty-doctors—Massage left to the unqualified too much, hence disrepute—Testimony to value from Plato, Hippocrates, Pliny, &c.—"Lomi-Lomi"—Suggestion to Channel swimmers—Procedure—Flicking and slapping to rehabilitate the devitalised—Value to boxers and the fatigued.

CHAPTER VI

CLOTHING

PAGE

97

98°4" Fahrenheit the key to the situation—Clothing is not essential—Science shows that it is economical—Cleanliness—The meaning of "warm"—Air as a "warm" layer—Materials of clothes are of secondary importance to their manner of containing air—Absorption and warmth—Flannel a heroic measure—The interdependence of food and clothing.

Clothing of Infants.—Ridiculous swathings—Older children—Bare knees absurdity—The susceptibility of joints—The kilt investigated.

Girls' Clothing.—Good points—"Hardening"—The experiment of the "Sun Brothers"—How originally excellent garb is stultified in older girls and women—Abdominal support of skirts—Proper position of belt.

Men's Clothing.—Hats—Panama eulogised—Women's better—No hat needed—Caps dirty but comfortable—Male garments—The absurdity of waistcoats—Trousers—The polishing of boots—The brushing of clothes.

Underclothes.—Pockets are dirty things—The white shirt—Objection to detachable cuffs and collar.

Evening Dress.—Collars—Garters—Braces.

Women's Garb.—Must follow principles stated under men's—Short skirts—Corsets, &c.—Athletic garb.

The danger of durable clothes—One suit a week the ideal—Cheap clothing commendable.

CHAPTER VII

THE SKIN

121

The beauty of health—Conditions revealed by the skin—Temperature, tactile, and heat mechanisms—The epidermis—The corium—"Finger-prints" and the "lines" of palmists—Keratin, hairs, sweat and sebaceous glands—Examples of neglect—The action of clothes upon the skin—An essential is absorption—Washing.

Soap.—Is a chemical application—"Running" water—No soap user can possess a normal skin—The mode of action of soap—Medicated and antiseptic soaps are largely futile—Difficulty of antiseptics.

Anointing the body—Pliny.

The Face.—As region of "objective mind"—Expression and beauty—"Bell's Palsy"—Physiognomy in infants—Of disease—

CONTENTS

xi

PAGE

Facial habits of expression as affecting the skin—Wrinkles—The Autocrat of the Breakfast Table and "Old Age"—Spencer and hard thinking—Electricity of the skin and strapping—Steaming—Face-massage.

Diet and Beauty.—Creams and powders—Pastes—Glycerine—Acids as astringents—Paints—"Tattooing"—A freezing necklace for hot weather—Arsenic.

Minor Afflictions.—Sunburn—Freckles—Acne, or pimples—Warts—Moles—Double-chin—Dusky skin.

The Lids.—Warning to smokers.

CHAPTER VIII

THE HAIR 144

The hard fate of the grey-haired—Other indications of unfitness much more trustworthy—Hair useless and dangerous as at present treated—Structure of hair—Temporary baldness—Causes and treatment of baldness.

Hats.—Compare with face—Head should be cool—Effects of hats—Various experiments—Hats are admirable bacterial incubators—The lesson of the pugaree—Follicles destroyed the hair cannot grow again.

Colour of Hair.—Greyness means vacuoles—Metchnikoff and "chromophages"—Patent preparations—Metallic solutions the worst—Paraffin—The X-rays.

Washing the head—Military brushes—Machine brushing—Dandruff—Shampoo.

Women's Hair.—Washing—Hair-pads are dirty—Hairpins—Curling—"The Rape of the Lock"—The best way to wear hair—Looseness of dressing—"Chromophages" killed by a hot-iron—Also the hair—Combs condemned—Brush twice a day—Wash once in three weeks.

Facial Hair.—Moustache—Beards—Barber's itch—Various depilatories.

CHAPTER IX

THE TEETH 158

Two complete sets—Not a Greek gift like appendix—Putrefaction—Dyspepsia and lung contamination—Intra-uterine beginnings of dental trouble—The effect of the comforter on the development of teeth and jaws—Child's food must not be too

hot—Teething should be painless—Lancing—Disadvantage—Ricky teeth—Attention must begin with the first teeth—Dental formulæ—Human teeth are omnivorous—Canines—Tusks.

Enamel.—Beauty of hard materials—The function of enamel—Neck of tooth is the vulnerable point—Caution in picking the teeth—The action of bacilli—Tartar—Dentifrices examined—Tooth-brush—Buy tooth-powders in bulk.

See the Dentist once a month, or at least once a quarter.—Artificial dentures must be kept as religiously clean as natural teeth—Take them out at night—The arrangement of the “bite” of teeth—Tooth-drill—Diseases shown by teeth—Gumbolls, toothache, &c.—The physiology of mastication—Bread at the beginning of a meal—More chewing requires less food—General oral cleansing is necessary for a sweet breath.

CHAPTER X

THE FEET—THE HANDS 172

Spencer's query—The existence of an arch—Walking should utilise the pendulum-like swing caused by gravity, and the heel reach the ground first—The weight of the erect body should be transmitted through the heel.

Foot-wear.—The heel—Why not heel and sole on the same level?—The “American” shoe—Bunions—Trigger-toe—Second toe the longest—Ingrowing toe-nail—Chilblains—Chloride of calcium—“Nothing like leather.”

Flat Foot.—Ligaments and tendons support the pedal arch—Muscular tone must be attended to—“Kipps”—Treatment—Why gout prefers the ball of the toe—How to measure boots—The value of plaster casts of the foot.

Keep the Feet Warm.—Sweaty feet—Detachable lining to boots—Cold bathing—Cold feet and disease—Blisters—Napoleon—Kipling—Alcohol—Soap—Corns—Callosities—Cancer—Gangrene—Ventilation of the feet—Boots illustrate once more the modern interference with muscular tone—For most of modern life shoes are ample—Fastenings—Turn the toes out in walking.

The Hands.—Passive movement and number of joints tend to cold—Gloves should have a detachable, absorbent lining—Necessity of clean hands—In warm weather don't wear impenetrable coverings—Hot water—Astringent washes—Dusting powders—Freckles—The nails—Cleanliness—Spots and furrows in nails—Professional manicuring.

CONTENTS

xiii

CHAPTER XI

LIGHT AND OZONE	PAGE 188
---------------------------	-------------

Light—Various conceptions—The spectrum—Light the source of energy from which we must not hide—Finsen's blue rays—Light is lethal as well as vital—Clayton's experiments—Browning's "Squander a Wavelet"—Flammarion showing the growth force of different coloured lights—Chemical rays causing sunburn, &c.—Sun baths—Effects of sun on a slum child—Platen's investigation upon the seeing animal—Wounded creep to darkness—Compare the wiriness of gutter children—Nordau on red rays—Absence of sunlight in towns evidence of Nature's one great mistake—Efficient fuel consumption—Windows—Frontage—Moonlight—Entangled light vibrations in the meshes of our cells are the source of our energy and must require renewal.

Ozons.—Ozone is of no actual value whatever—Tests for it are quite fallacious—Its presence at all is infinitesimal—And never in any case reaches the blood—May be of value in encouraging the taking of deep breaths—Or as an indication of absence of organic impurities.

CHAPTER XII

THE EYES	198
--------------------	-----

Relation between eyes and fitness very intimate—The eye registers many ailments with which it has apparently little concern—Carlyle as an eye "case"—"Dyspepsia"—De Quincey like Carlyle—"Sick headaches," moodiness, &c.—Statistics—L.C.C. and spectacles—A "disharmony" between man and his environment—Distant vision the intention—Close vision our modern need—The structure of the eye—This is an age of black and white at the closest possible range—Accommodation is unable to stand the strain—White paper condemned—Snow-blindness, museum headache, somnolence in church—Colour printing is no advantage—Exhausts one instead of all parts of the retina—Faulty artificial lighting—Change of occupation fails if the eyes are not rested—Value of billiard cloth—Tobacco blindness—Pathological eye systems of artists—The child's eyes—Pigment of eyes suggests colour of window-curtains—Time for testing eyes—At forty-five all eyes require investigation—Insomnia and hallucinations—Night walks—Minor accidents.

CHAPTER XIII

THE EARS

PAGE
216

The first sound given out by living organisms was probably threatening in character—Man's faculty of vicious circles—Results of noises of civilisation—Sources of noises—Growth of infants retarded—Deaf or mad—Noise, drink, and morphia compared—Ear-lids necessary—The whole mechanism of hearing—The stapedius muscle compared with the muscle of accommodation of the eye—Insomnia—Supernatural messages—The middle ear and Eustachian tube—Catarrh and deafness—Blowing the nose—Throat, nose, and ear relations—Wax in ear—Quacks—Coughing in church—Schools and noise—Deafness a deprivation of rhythm—Music—Acoustic indecencies—Practical suggestions.

Equilibration.—Semicircular canals—Affected by dancing—Connection with balancing—Vertigo by loud sounds—Hearing and equilibration connected.

CHAPTER XIV

THE NOSE

232

Smell an advantage or a disadvantage?—The *Odor Humanus*—Anæsthesia by hail of olfactory particles—Scherl and high pavilions—The sensitiveness of smell as proved by ambergris—Micro-organisms of disease are odourless—Intimate connection of nose and brain—Value of smell in animals—Protective in man to a minor degree—Smells and disease—Odours and health—Aroma, bouquet, &c.—Connection between smell and hearing by nasal mucous membrane—Importance of preserving the membrane—Investigation, therefore, of proper breathing—Mechanism of the nose—Filtering—Sneezing, "running" of nose, blowing it, all protective devices—Snuff, ammonia—Dust, and "nasal" speech—The handkerchief—Shape of nose—Hay fever and corollaries—Grasse and orange-blossom epidemics—The tests of smell.

CHAPTER XV

POSITION

242

Position in utero—Indian papoose—Shawl-carried children, &c.—Chinese foot—English boots—"Crossing the legs"—Faulty boots causing to walk "softly"—No excuse like this, however, for "soft sitting," which is the position of our age—Depend-

CONTENTS

XV

PAGE

ence upon ligaments—The anatomy of joints—The importance of muscle tone—Undue utilisation of gravity—The ill-effects—The sitting of children in school—Rightsidedness and speech—Onesidedness in the effect upon the nose—Effects of the desk upon children—"The White Company"—Drill as ineffectual exercise.

Writer's Cramp and other Disabilities.—Early massage—Pianists—Cigarette rollers—The standing of policemen, teachers, shop assistants, &c.—Short stature due to the thighbone—Squatting position of Japanese.

Good Position.—Form—Style—Grace—Due to parsimony in Nature—"Handiness"—The value of position in sport—Penalties if too protracted—Beauty of poise—A retiring curve desirable for ordinary uprightness—Effect of facial muscles upon brain states—Frowning—Smiling—Of value to inhibit all position or muscular groupings in falling—Testimony from children.

Knock-knees, Bow-legs, &c.—The fewer the stereotyped positions the more flexible is the body—The recumbent and no other is the proper position of rest.

CHAPTER XVI

HABIT 261

No voyage but follows definite paths—No nerve impulse but follows well-coursed nervous lines—Development—Our brain is in danger of forgetting its beginnings—Movement the test of conduct—The reflex arc our basis—No simple example—Derivation of reflexes from volitional movements.

Habit.—The memory of body-cells—Its extent—Dangers in individualism.

Levels.—Reflex, sensation and association—Habit is made possible in the highest level—Automatic action cannot become reflex—Reflex and sensory levels are laid down before birth—A few instinctive paths are blazed in the association areas—Compensation in man by ability to form habits—The physical basis of habit depends upon a cement—Habit spares energy and permits of accurate reduplication of movements—Danger of circumscription and narrowness—Easier to acquire new than to break old—Habits mean neither skill nor rightness—These require precaution—Habits like scratching the head.

Practical Applications.—In children—Sleep—"Original sin"—Instincts may be allowed to lapse—Habits of thought were expressed in "Essay on Education"—The value of heresy and fade—"Man, know thyself!"

CHAPTER XVII

THE FUNCTION OF THE PHYSICIAN

PAGE

. 279

Chinese fables—One of them worthy of consideration—Medicine should be preventive—The change rests with the public—The opinion of the general practitioner himself—Diathesis—Occupation and other data from which may be derived suggestions regarding the conduct of life—The diagnosis of perfect “fitness” more difficult than that of marked disease—Why?—A quarterly medical inspection should be the minimum—Present method of paying doctors forms the obstacle—Suggested percentage on income as assurance for health or against doctor’s bills—Fallacy of present method—Greater recognition of doctors by the State and protection against quackery needed.

INDEX

. 285

THE CARE OF THE BODY

CHAPTER I

MOTIVE OF BOOK

The healthy body undefinable—Why?—Normal expectation of life according to Metchnikoff—Assurance methods—Human life dependent on environment—Complication introduced by volition—Principal remaining antagonist to longevity is bacterial—Disease so far as it is bacterial only occasionally eradicable—Malaria as example of eradicable disease—The “intermediate host” explaining this—Tuberculosis in its various forms, different from malaria, cannot be so quickly attacked through its micro-organism—Attention directed, therefore, to the condition of “unfitness” that may be amended—Bacillary history of value in suggesting precautions—Simplest immunity is bodily fitness—Condition of “Phagocytes” depends upon condition of body—Condition of body is affected by sleep, exercise, habits, &c.

THE healthy body is not an entity which it is possible to define in one succinct phrase, and so much will be admitted by any competent physician, though the omniscience of the “obscure vulgar,” now more popularly known as “the man in the street,” will equally lead him to deride this statement.

An axiom of childhood associated with the name of Euclid will help to explain the difficulty; for the healthy body, like the mathematical whole, is equal to the sum of all its parts, and the health of the whole can only derive from and depend on these. Like the speed of a fleet or

the pace of an army, the course of life is decided by the weakest members or organs. So that with the Delphic oracles of which the interpretation turned on the event, it is usually only possible to conclude whether a man has indeed been entirely healthy after his death—with our present methods of investigation, at least.

Professor Metchnikoff has settled this question for us in his "Nature of Man," by deciding that the healthy individual should live to the age of one hundred and forty. It is his suggestion that no death occurs in the proper fashion, which should be of all the parts equally—as in the historic disruption of the "Deacon's Masterpiece"—but that it always ensues prematurely from actual disease of one or more systems of the body, and that therefore a genuinely healthy man does not exist. Accepting his arguments, death at one hundred and forty is the only possible certificate of health, and in the absence of any such phenomenon we are led to conclude that health is an unattainable ideal.

To turn to quite another source of information, and, after this Russian cold douche, a much needed encouragement, the tables of any assurance company show us what must be the average expectation of life at any given age, and if we are content with the lot of our fellows and willing to acquiesce in a similiar destiny, then ordinary health will suggest itself as that vital energy, which will prolong our "fitful fever" to the time the actuaries are willing to allow us: it being, of course, understood that life during this period shall not be in any way a burden, and that bodily comfort shall largely preponderate over pain, fatigue, and misery—since there can be little satisfaction in fulfilling the prophecy, "If by reason of strength they be fourscore years, yet is their strength labour and sorrow." This, then, may serve as basis for the probable duration of the ordinary healthy person, while in addition

to the power of living long, the ability to live completely—to use Spencer's phrase—must be the test of health.

The life of man, like that of every living thing, has been throughout his history a struggle with or an adaptation to environment: that adaptation has so far been successful, our presence proves. But in the last few æons this ability to harmonise with surroundings has been complicated in the case of man by the development of faculties, which, though on the one hand they permit him to reinforce the blind selective powers by which he had so far progressed, are yet also potencies of evil, since they permit him to ignore and controvert the base degrees by which he did ascend. The supreme power of man is his volition: by means of it he allows his impulses to exude in concrete bodily movement or action, or more subtly he inhibits movement of any kind. How this faculty has arisen is not our concern: our business is with the results produced by its existence. A man may forswear his Maker, exclude the sunlight and commit suicide, and he need not be insane as a merciful jury understand it. He was not healthy, though that is not quite the same. The emotions (which are man-made) are not to be trusted—that is the crux of the matter. The sensations are trustworthy, and it is not possible to pervert a pure sensation. Thus the making of the emotions absolutely trustworthy is one important phase in caring for the body.

Man is no longer attacked by foes of the calibre of the mastodon, the giant lizards, or sabre-toothed tigers, nor, except at infrequent intervals, is he now prone to be murdered, either individually or on the large scale of war, by his fellow-man. As his boundaries have widened his foes have shrunk, till in our day they have chiefly to be sought by the microscope. The principal conflicts of humanity are now with disease and death. The latter is postponed, excepting accidents, by whatever wards off

the former, so that to-day the question of caring for the body resolves itself into the very practical matter of guarding against disease.

As a result of the discovery by Pasteur that suppuration was due to the life of minute vegetables, the twentieth century is in possession of full knowledge regarding the active agent in disease. What more simple, then, than to do what it has done—institute campaign after campaign against the bacteria, and with sometimes the promise of ultimate complete success? Malaria has been the scourge of all the world, for as long a time, probably, as there has been a world of men; but there is actually reason to believe that malaria, with the pest that produces it, will be abolished. From such a fact the larger inference is easy and appears to be justifiable. Such inference, however, is one more illustration of the danger of that “little knowledge.”

It is true that malaria is caused by a tiny living thing that is almost as low in the scale of organic life as the bacilli, and it is true that the disease is caused by the settling of this “hæmatozoon,” as it is called, upon a suitable feeding place—the blood of man. But this is not all that goes to the development of malaria. There is an essential intermediate stage of the organism which requires its life to be spent in the mosquito. To endeavour to trace and kill the hæmatozoon itself is evidently hopeless; neither is it permissible to kill off the men within whom it has settled. A third possibility is, however, practicable, and in the paraffining of stagnant pools, the draining of others—the elimination, in fact, of the dwelling-places of the larvæ of the mosquito—Major Ross and his fellow-workers have shown in West Africa how the problem may be attacked from this side. With the disappearance of the mosquito must disappear malaria.

The factor which led to so hopeful an outlook was then

the discovery of the importance of an intermediate host—the mosquito. Had it not so large a share in the transmission of the disease, and if the matter were one simply between man and the micro-organism, the difficulty would be evident. There *is* this difficulty in the case of an affliction more important to Englishmen, for consumption and every form of the result of the feeding of tubercle bacilli upon men requires no intermediate stage. Given the suitable man, the bacillus is always there and the matter is arranged—arranged, too, so frequently and on so grand a scale that a name has been borrowed from the terrors of a visitation of some centuries old; but so quiet is this establishment of a deadly harmony between man and the bacillus that there are still people who scoff at the measures directed by a wise sanitation against “the great white plague.”

Tuberculosis is an example of a disease that probably cannot be exterminated by any direct attack. It is absolutely impossible to destroy all the bacilli: it is only too likely that so long as man exists they also will exist: possibly even after him, as they or their prototypes undoubtedly did before him. The extent of the problem that would be involved by any attempt to attack the bacillus of tubercle will be perceived when it is recollected that from one or two of these bacilli there may in a day or so, amid favourable surroundings, proceed descendants to the number of several millions: their extermination, then, can be left out of the question, but though they may not be wholly destroyed they may be thinned; and to this, sunlight, where it is permitted, will attend, as will also other sanitary precautions.

Attention must, therefore, be directed to the other side of the matter—those qualities in man which make him a suitable host for the bacilli—and it is very speedily found that these depend upon what in a word may be summed

up as "unfitness." It is not claimed that the fittest man on earth, whoever he may be, has no tubercle resident in him anywhere : the probability is that he has. But the relation between this and himself is of such a nature that actual disease will never manifest itself from this cause : and that is the utmost that we can hope for, and, indeed, the most that is needed.

The discovery of bacilli—and these come at approximately the rate of one a month—is of chief importance by enabling us to investigate in their life-history those conditions which favour their growth ; and with this knowledge, the power readily comes of being able to prevent the formation of such conditions. We find, for instance, that the indeterminate organisms of rheumatism, or those of influenza, prefer human sites of which the resistance has been immediately lowered by a chill, and the warning of such knowledge is plain. Once realise that diphtheria has an affection for the winter months, and it is possible to anticipate its onslaught by careful asepsis of the children's throats in that season. Typhoid has a preference for dirty water, scarlet fever for dirty milk, and so on through all the bacilli that flesh is heir to. There is ample warning in their habits to attend to our own also.

This chapter, and, in fact, this whole book, is merely a teaching of the simplest methods of preserving immunity from disease. Measles may be as deadly and kill as quickly as cholera in one instance, where in a hundred others it is little more than an inconvenience. Diphtheria, as in a case I have seen, may kill like a rifle-shot, yet of others in the house with the same disease not one died. Protect a child from scarlet fever and half a dozen other affections till it reaches the age of five years, and the chances are that it may never suffer from any of them. From such illustrations, and hundreds of others, we derive the truth that it is the condition of the indi-

vidual which counts—the micro-organism is of secondary import.

When Metchnikoff points out to us that the white cells of the blood are—some of them—concerned with the active prevention of disease, we are interested, and frequently misled by our interest to attempt an undue interference with these “phagocytes”—we want to stimulate them to impossibilities; and when such attempts fail, as in the case of inoculating with a serum for, say, Blackwater-fever, we are too wont to imagine that we have not chosen the proper agent for this stimulation: so we try another and another. There is a tendency, as marked in the scientific world of to-day as it was in the darkest days of magic, to make one explanation and procedure satisfy all eventualities. It is time to realise that there is probably a limit to the power of the leucocytes so far as direct action upon these is concerned, and that sometimes failure is due not to choice of reagent but to the attempt having been made upon the leucocytes at all. There is no need to go into more than generalities, and these of course are open to obvious attack; but, as plain men wishing to deal in the way that is approved of all men and nature itself, we had better take first of all the undoubted good that does without question apply to all men and all disease before we attack subsidiary measures.

This we know, that the health of the phagocytes is as the health of the body, and that to keep the former in fighting order the greatest of all steps is made by ensuring the health of the latter. In the preservation of bodily health, experience, medicine, pathology and physiology are all agreed upon certain points. It is with certain of these points that this book is concerned. Not even the perfectly healthy human body can repel all disease: that is not asserted: but the number of conditions with which it is quite competent to deal without outside aid is by far the

greater number of those by which we are surrounded—tuberculosis, the greatest scourge of all, being, as already said, totally dependent upon the state of bodily fitness. If every man, woman, and child in England were physically “fit” there would be no consumption.

Let us, then, without omitting the altar to the “unknown god,” fully appreciate those gods we have. The effects of sleep, exercise, light and baths, habit, &c., are known to us in terms of skin and visceral reaction ; we know their influence upon circulation, respiration, and the contents of the blood. We are well aware that by so simple a thing as rubbing, fatigue may be abolished, and why this should be so, and we are not to-day in doubt of the mutual reaction of mind and body.

This is a scientific age, and though it may have a curious aspect, it has been actually necessary to invoke the aid of the latest science to justify what it would be imagined should be first principles.

CHAPTER II

SLEEP

Introductory consideration of dreams—Sleep and rhythm—"Law of Dissolution"—Attention and judgment always awake save during sleep—Fatigue is a brain state—The ergograph—Changes in brain cells caused by functioning—Reintegration of brain cells requires anæmia—Effects of any stimulus upon cerebral circulation—Hypnotists, mesmerists, and Indian hill-thieves compared—The effects of hyperæmia—Oliver Wendell Holmes—Sleeping over a question—Dreams and insomnia—Visual cells most worked—Hallucinations, ghosts, &c.—Psychical research—Hamlet and Macbeth.

Duration and Time of Sleep.—The infant, adult, school-boy—Neurotic sleep—Extra time needed by women—And by every one at various critical periods—Exceptional cases—Bed-time—Continuous sleep is peculiar to man—The "Vital Tides"—Ten till seven the best time—Why not twenty minutes every hour?

The Bedroom.—Semi-asphyxiated sleep—The open window—Size of room—Night air fallacy—Effect of light—Furniture—Colour of walls—No straight angles—Polished floor—Position of bed.

Bed-furniture.—Mattress, sheets, &c.

Bed.—Length—Width—"Tucking in" of clothes—"Airing."

Methods of wooing sleep—Warm bath usually the best—Position for sleeping—Position and deformity—Dangers of insomnia.

Cervantes on sleep—"Tired nature's sweet restorer."

FROM the first dream in which prehistoric man saw once again his departed chief or father, through the long corridors of history which connect the whole of the past with our own time, visions have exerted an extraordinary influence upon the fortunes and movements of the human race, and principally visions that have appeared in sleep. The priests of Egypt and Babylon based their

warnings and their wisdom upon them as much as did those of Greece or Rome. Biblical history is a record of the value ascribed to the interpretation of them by Jew, unbeliever, and Christian. Joan of Arc moved a nation to arms by her visions. But the mighty have fallen, and while still the Arab is moved to faith, and the old woman to prophecy, and though still an occasional Coleridge is able to use the material of his dreams, the chill light of a modern science has placed them among the things that should not be, the abnormal, almost the pathological: so that Maury is emboldened to declare that to dream is to approach the borderland of incipient insanity.

"If he sleep he shall do well," declared an olden medicine; if he dream he shall do ill, say the physicians of to-day.

This degradation is a curious history of science, in which the first step was taken by him who first killed his neighbour by battering in his skull: thence a longer step to the inquisitive one who gazed in upon the hole thus made: longer still to the thinker who associated brain with life and thought: more thousands of years till Harvey found that the blood circulated: and, linking these primaries, all the millions of men who have gazed and thought and experimented, till finally Durham watched through a glass plate the ebb and flow of the blood in a brain, as a dog slept or awoke. And now Gotch is able to declare at what period of the night a neurotic individual will dream!

Sleep, to be most refreshing, must be dreamless: there should at least be no such activity of the higher levels of the brain that even the faintest memory of it should persist after awaking.

In these post-Spencerian days there is little need to insist upon the universality of rhythm. From nebula to star and back again: from day to night: summer to

winter: dust to dust: the whole of creation eternally swings in a system of balances, the motion of these being carried through an infinite gradation to which must keep time the life of the world, of man, the molecule, and the atom. There is no exception. Man waxes and wanes, his heart beats and rests, his brain works and must sleep. However independently the rhythm arises, the incoercible necessity is there. And of sleep the proximate cause is fatigue, not day or night, nor the succession of the tides, nor the influence of the moon. Simply fatigue, whether bodily, mental, or both. It is a resting stage, and is not peculiar to man, but may be traced through the higher animals and birds, to reptiles, insects, the crustacea and even the bacilli, though in modern man it has characteristics of difference from that of even the animals closely related to him.

Thus we may accept the statement that sleep is a time for rebuilding those cells which have been engaged in the higher operations of consciousness, and that it is from the condition of such cells that we arrive at the various criteria which decide the best time, duration, and kind of sleep—along with the thousand and one other considerations rendered salient by the highly artificial life of civilisation.

The order in which the various mental faculties become blunted by the onset of weariness is the reverse order to that in which they have been developed: the more recently acquired being the more sensitive. This is according to the Law of Dissolution and is well evidenced by the action of alcohol, and in fact of most poisons, upon the brain. Attention and judgment are the first to disappear, then memory, imagination, and the power of speech; while, extremely significant, the eyelids droop, and the head tends to fall forward. For the best

ability to judge and attend clearly more sleep will be necessary than might be demanded for a quite full exercise of the imagination and emotions, since these, being of earlier evolution, are more stably constituted and more resistant to fatigue. But man is highest as his attention and judging powers are keenest, and by these, then, must his need of rest be estimated. It is evident that but for those higher faculties the need to sleep would be much less, and in fact there are realms of the body which one would at first imagine do not ever sleep. For instance, the movements of the stomach and bowels, though undoubtedly they are lessened, yet certainly do not cease. The heart beats faithfully by night as well as day, and we never fail to breathe no matter how deep the slumber.

There is a difference, however. The activity of these lower systems, including that of their innervation, takes place in waves ; and the intermissions are seized upon to do all the reconstruction necessary. Between beats the heart and its nerves are rebuilt to the extent which the beat has made necessary. Otherwise there would be heart failure. Even the eye has its periods of rest—those twentieths of a second when it is covered by the winking lid. Attention and judgment are, however, in the ordinary citizen's waking day never asleep save when he himself is ; assuming that he is neither a drunkard, morphinomaniac, nor other unconsidered disreputability. For while he is awake he is seeing, hearing, and thinking. By this, then, is impugned the folly which would have man model his slumber on that of the beasts. Let him attend to his judgment, and when that fails, go to bed or otherwise change his ways.

It has to be carefully noted that, even in those cases of hard bodily labour where the higher nervous centres seem to be completely out of action, fatigue is dependent upon

the brain and not upon the muscles. There is a very convincing experiment in this connection which any one may perform for himself. Place a finger in a loop of string running over a pulley, and having a small weight attached to its lower end. The apparatus is dignified by the name of the ergograph, the meaning of which, from the prevalence of ergophobia, will be readily understood. Move the finger, the wrist and arm being held steady, so that the weight rises and falls; and continue doing this till it is impossible from fatigue to perform another movement; yet the galvanic current will cause that finger to contract actively, and so will faradism applied to the nerve. This shows that the fatigue is due to neither the muscle itself nor the nerves controlling it. And by further elimination it is found that the failure takes place in the cells of the brain. From this the lesson is clear. Whether brain cells become bathed in the excretory products of their own activity or in products derived from the action of muscles, the result is the same though it may differ in time: the brain cells are the first to protest and demand rest. Naturally, direct action, as in intellectual work, would supplement the result of bodily exertion; and this is proof sufficient that the claim for the advantage to the tired body inherent in change of occupation is an exaggerated one: a point which is worthy of note by the various exponents of systems of physical culture.

To this we come, then, by whatever path, that a period of reconstruction is essential to brain cells; that its duration must be judged by their needs; and that no rest is sufficient or satisfactory which does not ensure their complete reintegration.

The material basis of morals, mind, and soul exists in the cells of the brain, which number anything from six hundred millions to two thousand millions, or approximately the number of the people of the earth. They are

various in shape and function as the different men they serve, but have the same physical needs—food, air and water. In fatigue their food stores diminish, especially those contained in certain spindles, and they shrink considerably in size.¹ The renewal of these stores is the function of sleep; and in order that such renewal may occur it is necessary that the ordinary supply of arterial blood to the brain be interrupted. The innumerable millions of red cells contained in this blood, each carrying its quota of oxygen, are not builders but rather fire-brands, by the activity of which the bodily combustion is maintained and its energies and heat secured. Oxygen is not a food but a user of food, and from this arises the necessity for a certain degree of anæmia of the brain, in order that the food supplied to it in the necessary form by the lymph and blood may not be oxidised equally rapidly.

The question as to how this anæmia is secured is still in dispute, but, in the flushing of the skin which accompanies all healthy repose, one of the mechanical devices towards this end is visible to every one. The amount of blood in the body being a constant quantity, the dilatation of the immense areas of blood-vessels in the skin is bound to drain largely all other parts, including the brain. At the moment of dropping off to sleep there is an instant pallor of the cortical ² surface, while at the moment of awaking the reverse occurs. The depth of the sleep is, in fact, proportional to the brain pallor. Flushing of any part of its surface indicates a destructive activity at that part, and an almost certain amount of dreaming, the kind of which will depend upon the special area.

Let any one go to bed with a heavy, undigested supper,

¹ See also Dr. Clouston's "Hygiene of Mind," in the New Library of Medicine.—EDITOR'S NOTE.

² The cortex (or "bark") is the grey, cell-containing matter of the brain.

who has been worrying over business or any other futility during the day. Then instead of an equable set of organic stimuli passing to the brain and accounting, though undistinguished, for a condition or sense of organic well-being, there will be a preponderance of urgent messages from stomach and intestines. It is common knowledge that active churning movements and free secretions of gastric juice and so on are needed for healthy digestion. But instead of this heavy supper being thus attended to, sleep has diminished these movements and lessened these secretions. Little wonder that there is a digestive revolt. The messages sent from the disgusted organs are naturally of an unpleasant kind, and may be violent enough to wake the sleeper. But if they fail in this and redress is not thus made, they wander into the easiest brain channels that are open to them: find that certain cells, those that have been used to worry with, are still somewhat on the alert: there is a prompt fusion of grievances, and the result is a well-deserved nightmare in which the cashier has absconded with all one's worldly goods—and other equally cheerful happenings. The sufferer wakes in a cold sweat and imagines he is sleepless on account of his worry. Yet all of this psychical storm that would be revealed to the scientific observer, if his patient were fortunate enough to possess a glass skull, would be the slight extra reddening of a few tiny spots of brain surface.

Whisper in a sleeper's ear and it may be possible to dictate his dream. Prick or irritate the skin, and again he will dream. And so from any part of the body it is possible to communicate with the sleeping brain and suggest to it, by a reflex stimulation of its blood supply. All of which reads, as will be at once observed, very much like what is done in mesmerism, clairvoyance, hypnotism, revelations of odylic force, &c., &c. And they are all related. The lower world of the body is

still active, though the cells of higher consciousness are semi-comatose; and sleep, the hypnotic state and the others are merely variations of that one condition—of which the essential is that these higher centres shall not be in full control.

There would seem to be little analogy between certain desperate hill-thieves of India and the wonderful works of the mesmerist. But the means by which the Pathan gets the coveted rifle without the dangerous necessity of cutting a throat, depend upon the same conditions by knowledge of which the mesmerist imposes his "will" upon his medium. The Pathan crouches by the side of the soldier sleeping upon his rifle: he gently tickles certain areas of the soldier's skin till movement of the body shows that the message has reached the brain: by graduating the tickling or skin stimulation till those movements have been made which disengage the rifle from the pressure of the body, the robber secures his booty.

The required action on the part of a sleeper is thus obtained, and if the method by which the unconsciousness is developed be ignored (and there is nothing abstruse in this) the similarity between these reactions and those obtained by the mesmerist is clear, the difference being only in degree. Similarly we may explain somnambulism, that dangerous complication of unrestful sleep in which, responding to some outer stimulus, the sleeper may walk, talk, even see and hear, as well as act. All are due to a hyperæmia of portions of the brain, insufficient to awaken full consciousness but sufficient to produce a certain amount of energising.

The word "outer," used above, must be noted, for it is hard to realise that what we call our entity or Ego resides in microscopic groups of cells, for which even the rest of the brain forms quite as much an outer world as the rest of the body or universe.

Probably enough has now been said to indicate the value of anæmia to the brain during sleep, and conversely the dangers of hyperæmia, either localised or general. Now general hyperæmia of the brain is the condition to which an unwise generation endeavours to condemn us. Even Dr. Oliver Wendell Holmes, who might have known better, sings the praises of those "bulbous-headed" individuals for whom, while studying, it is necessary to keep the feet in hot water on account of their liability to become cold. That is most vicious approbation. It is bad enough to raise bumpy muscle all over, or in special parts of, the body, but that can at least be trained down again, by the atrophy of some of the muscle cells and the disappearance of others. But you can never train your brain down. The cells of the brain are strictly limited in number, and cannot be reduced without disease resulting. So if through *trop de zèle* any one persists in maintaining a state of literal "redheadedness," in which the rest of the body cannot at the required moment (bed-time) drain off the superfluous blood, either from inefficiency in its own neglected mechanism (as is indicated by cold feet) or from a refusal of the brain itself to submit to such dictation, then that person must dream or suffer from insomnia, or both, and is in a fair way towards a serious breakdown.

Muscular action, as already stated, has limits set to it by the state of fatigue caused in brain cells, but the check to brain activity itself is by no means so efficacious, since it is permitted to go on thinking, for example, about the very action that has been forced to stop, long after the stoppage has been enforced. There is yet another contrivance for safety in voluntary muscular action, since, if this is persisted in too long, the brain is shut off from actual concern in it, and the movements

become practically reflex. Only thus can be explained those extraordinary club-swinging feats in which the action has been maintained for twelve hours without cessation. In similar fashion battles have been fought by dead-tired men who have had little after-recollection of what happened.

There is, however, no mechanism for thinking reflexly to the best advantage: though a near approach to it is made in that process which is known as "sleeping over a question." This method of solving any problem can only occur when the answer is already somewhere in the contents of the brain. It consists in the removing altogether of that attention which has become attached too strongly to one aspect of the difficulty, and in allowing imagination to have freer play: both of which phases of consciousness occur when one is about to fall asleep or just before complete wakefulness, so that naturally these are the times when "thought" would seem to be clearest and most productive of the necessary solutions. The actual sleep itself would, of course, also benefit the faculties generally.

Since, then, there is difficulty, not only from the nature of the subject, but also from the excuses to which man is prone in the way of justifying laziness, in deciding when any man has worked his brain sufficiently, we must rely upon the statement that his sleep, or rather the want of it, will at once advise him if he has overdone it. And if sleep is deep, dreamless, and thoroughly refreshing, indicating that the body is co-operating loyally with the brain in securing the proper degree of cerebral anæmia, then it cannot be far wrong to say all is well; and *vice versa*.

Sleep with dreams, even if these are pleasant, cannot, for the reasons stated, be as beneficial as dreamless slumber, but either of these is preferable to actual insomnia,

in which no part of the brain is securing complete rest. The causes of insomnia, like those of dreaming, are as numerous as the activities of man. Almost anything, in fact, can cause either sleeplessness or dreaming: too great a strain, too little work, cold, heat, a draughty room, a stuffy room, a cramped position, faults in the bed, the pillow, or the bedclothes, emotion, heart disease, high blood pressure, low blood pressure, too much tea or the lack of tea—and innumerable other causes. According to Broadbent, the commonest cause of all is dyspepsia, but since dyspepsia proper is outside ordinary physiology it hardly enters into our subject. The effect of late meals is very different and, as mentioned, may be quite sufficient to account for distressing nightmare or actual sleeplessness. But that is easily remedied: let the last good meal be taken three hours before bed is reached, so that the heavy work of digestion may be performed before the lessening of the activities of the organs of digestion can materially interfere with it, and there is little likelihood of any gastric catastrophe disturbing rest.

There is one factor, however, which does require careful consideration in connection with this matter of disturbed or incomplete sleep and sleeplessness: it is that of the use of the eyes. The predominance of things seen must have been noted by every one who has dreamed: an indication at once of the area in which lies the chief trouble. For if visions are the principal components of any dream it is evident that those cells which have been concerned in seeing are still active. It is a condition, in fact, of too vigorous a blood supply to these parts, which indicates that they have been over-used. It by no means follows that the initial stimulus which led to the dreaming came from the eyes. These are well protected in slumber, since the pupil is contracted, the eye well

turned up under the lid, and the eyelids closed. But it is a fact that if any part of the brain has been too greatly exercised the resistance of this part to disturbance is lowered, and stimuli which in ordinary course would have taken quite a different direction are readily diverted to it. So that a nerve impulse coming from such dissociated regions as the heart, a cold foot, or a cramped muscle may yet arrive in the easily accessible channels of overdone visual activity, and actually result in the calling forth of images. This process, once started, has almost limitless possibilities through the contents of the visual cells of all the images of the past: a twenty-year old visual memory may find itself linked, by the uncontrolled passage of the stimulus, with the scene of yesterday: there is neither time nor space in dreamland. The visual cells, then, which most of all are worked in the exigencies of everyday life, and which on that account are most in need of rest, are the very cells which are least likely to obtain this in dreaming. And as dreaming is a minor degree of wakefulness the statement needs little expansion to suggest the commonest cause of insomnia: in those cases, of course, where actual disease is excluded.

It is, in fact, justifiable to conclude that, where no special form of brain activity has been overworked, and where the areas concerned with vision are in as normal a state as the others, no stimuli arriving from the organs of the body are likely to cause dreaming. This may explain the apparent anomaly of the labourer who can eat a huge meal, drink a quart or two of beer, and yet sleep immediately thereafter with the sublimest of content and satisfaction. There will be probably some grumbling among the lower clusters of cell centres in the nervous system, but the trouble does not reach the attentive or remembering regions.

To go to bed with the brain in a high state of functioning

over any subject is clearly a mistake: sleep may certainly be attained, though this is doubtful, but it would be better to allow time for the turgescient regions gradually to subside. Professor Chiene's advice to his students was to put in half an hour at least after working, over a novel of just sufficient interest to keep the attention without engrossing it. That was sound advice based on the best science of the brain in its relation to sleep.

This matter of dreaming, considered chiefly as a phenomenon of visual memories and images, bears directly upon the question of hallucinations, visions, ghosts, and their various allies.

If the reader has ever suffered from any long illness and had the misfortune to be confined in a room the walls of which were covered with a patterned wall-paper, the dancing shapes which its maddening lines have assumed in his sick fancies have taught him all there is to know about hallucinations. It is to be noticed that scarcely any physiologists are enlisted in the ranks of any so-called research investigation or examination society concerning itself with psychical phenomena. We need not consider the "evidence" that is willingly submitted to us by the principal English society engaged in propagating a belief in the validity of such visions. This has already been examined by many critical scientists, and their refutation of its claims for credence is sufficiently convincing as well as scathing. It is enough to say that, if we have at our hand conclusive proof of how all such apparitions can occur, it is decidedly supererogatory to imagine undemonstrable conditions in which they might occur. We know that a number of brain cells are concerned in the operations of vision and visual memory: we also know that these cells are the most likely to suffer from overwork and from want of rest, and that, in this state, they are peculiarly liable to attract to themselves nerve

impulses arising almost anywhere in the body, with the result that things are apparently "seen." If, in addition to any of the causes resulting in over-oxygenation of these brain areas, such as insomnia, profound emotion or excitement, there is also some slight defect of the eye mechanism itself, in fact bad eyesight, then there exists in such a combination an almost irresistible tendency to see ghosts: and the ghosts are duly seen, reported, and indexed.

Attend, then, to eyesight and sleep on this score also, otherwise the fate of Hamlet, Macbeth, and their modern successors will be imitated in your case. It may not be irrelevant to point out the kinship of the results obtained in dreaming, the visions of over-strained eyes and insomnia, the hallucinations of emotionalism and the actual hallucinations of the insane—in whom also the visual predominates. When the sombre Prince of Denmark considered the desirability of death, it was the fear of dreaming in even "that sleep of death" that gave him pause.

The insomnia of an individual suffering from too high a blood pressure, or from the opposite condition of the neurasthenic, in whom the pressure is too low, is rather a symptom of pathological conditions, but the simple devices of purging in the former and a cup of tea in the latter are frequently so effectual that they may be mentioned. The treatment of the insomnia of the comparatively healthy is principally a matter for discussion under time and duration of sleep and the sleeping-place, where, therefore, it will be considered.

Duration and Time of Sleep

The healthy new-born child, which has slept continuously, and thrived, for nine months before birth, carries on the sleeping habit for several months thereafter and, save

when taking its meals, sleeps all the time. With increasing age the amount required diminishes till, when seven years old, half the day suffices for rest, and, at eighteen, nine hours only is required. The adult may, if he is a good subject, lessen this by an hour, while old people may be amply satisfied with seven, six, or even five hours at a stretch. There is interest in the fact that, twenty years ago, the "Encyclopædia Britannica" declared seven or eight to be the allowance for an adult, while to-day the tendency is all in favour of adding an hour to this.

There is undoubtedly now a consensus of medical opinion that the allowance of sleep has recently been too little, particularly in the case of school-boys, and that no growing lad should have less than nine hours. Along with this has also occurred a denial of the fetish of early rising, unless accompanied by early retiring. Sir George Darwin advises us to forfeit some hours in school rather than some hours of sleep. Acland accuses irrational early rising of being the cause of nervous break-down, strain, insomnia, chorea, and epilepsy, and emphasises particularly the truth that physical exercise is no compensation for want of sleep; it is, in fact, an admirable illustration of lighting the candle at the lower end to make up for burning at the upper. Bevan Lewis attacks also the dangerous assumption that change of occupation means relief to fatigue, since fatigue anywhere floods every area of the body, including the brain, while sleep means relaxation everywhere. And to connect more directly, as has already been suggested, the matters of too little sleep and insanity, Lewis declares that the dangerous variety, adolescent insanity, is most likely to occur in neurotic individuals having inadequate rest and sleep, and that in such cases ten hours sleep is not too much. The characteristic of normal sleep is that it is deepest in the first hour and gradually shades off to the time of awaking; while in

neurotic sleep the first hour or so is deep, then comes a long shallow period, and later, towards the hour of rising, again a deep period. The value of every additional hour of sleep beyond the first to memory particularly has been thoroughly proved by the German investigators.

The intensity of sleep is measured by the loudness of sound needed to awaken the sleeper, but the variations of intensity for different individuals are very wide, though the sleep in each case may be perfectly refreshing. The light sleeper is quite as normal as the deep. We are on the safe side if we declare that every man, as an average, requires at least eight hours, and every woman, nine. The difference between the two is explicable by the difference in sex and the function of each, man being catabolic or destructive, while to woman is relegated the greater share in construction or anabolism : for the sexes, while they may be equal, are different. In addition to these broad rules we may remember that there are recurrent periods of greater outflow of energy in the case of woman when this duration of rest requires lengthening, and periods of fewer occurrence when, from a double work of construction, rest should again be increased : a consideration which should induce the governmental debarring of every woman from the work of a labourer, as Dr. Newman has convincingly shown.

At puberty, adolescence, and all climacterics there is especial need of attention to securing that amount of sleep which each particular case demands. Boys or girls should never be allowed to "sit up late," even—or rather, most especially not—for dances. Regularity in time and duration of sleep is essential to the growing organism.

Lord Kitchener, it is said, can sleep at any moment : so can most doctors with busy practices, and snatches of sleep are always better than none. Napoleon is quoted as

finding five hours ample : it is significant, however, that Napoleon was an epileptic. Certain hysterical subjects have slumbered for from four to ten days ; and in the other direction there is record of a famous bout of card-play which lasted ninety hours. There is as little justification for imitating these exceptional cases as there is in imitating the habits of the old. Sleep is the period of growth : the baby is growing and multiplying everywhere, hence its need and, in a minor degree, that of every child. The adult has to replace what he has used in work and thought, but the old have laid down in their earlier life every cerebral path which is of use to them, and their bodily exercise is strictly curtailed : their life is in using the work of the past, and their thought is strictly limited to the paths they have already laid. Not for them the fiery glow resulting in the communicating of new brain areas by difficult connections of association fibres. And the proof of this is in their little need of sleep.

The other aspect of the duration of sleep is worth a passing mention. The maximum for safety cannot be laid down. Terrific and prolonged exertions have resulted in healthy sleep persisting for twenty-four or even thirty-six hours ; and there are cases of even four and as much as ten days' sleep on the part of hysterics. There is little risk, however, of the ordinary citizen getting too much, though it may deserve reference that one or two physicians believe that actual harm may result from excess.

The usual bed-time is determined by the customs of the community ; there is no absolute reason why we should not imitate the life of the night-watchman and sleep all day. The terrestrial revolutions exert no coercive influence, though indubitably the darkness and the lessened noises of modern life during the night are factors of some importance. The "eight till two" of the Trappists is valuable, if not for its duration, at least in its time of

commencement, and a suggestion for phthisical patients has been based upon this, since in the early morning the air is at its purest, while the darkest and quietest time has then been utilised. It is interesting that the habit of continuous sleep for a comparatively lengthy time is peculiar to modern man, and is probably derived from his sense of security.

There is, however, sound science at the basis of the old belief in "beauty-sleep" and the value of the hours before twelve at night so spent. The gist of this may be summed up in a phrase used with great affection by Professor Wyllie, of Edinburgh, since from one to three a.m. "the vital tides are at their ebb." It is very evidently well to prepare the body generally for these fateful hours, so well known to the general practitioner, and there can be no better preparation than the reconstruction and building obtained by several hours of sleep. Hence the reasonable hour of going to bed is ten, or at latest eleven. We are not here concerned with the fashionable and other foolish exactions of town life: our subject is the care of the body. The attractions of the "wee sma' 'oor ayant the twal" are various and many; but Burns died at the age of thirty-seven.

The best time for the ordinary man or woman to sleep is from ten to seven, and, since the strain of life—working life, at any rate—is much the same from day to day, the need for the observance of these hours of rest is a daily one. There are people who have worked part of an hour and slept the rest of the hour, and kept this up for weeks. That attempt by the curiously named Tony Todd, to walk two thousand miles or so in one thousand hours, is a striking example of this. Really there seems no reason, apart from habit, why we should not divide our work and rest similarly, say by working thirty-five to forty minutes and sleeping the remainder of each hour.

That this is possible has been proved. But since most work has to be done "in the lump," so to speak, rest must be arranged similarly. We may notice that the heart arranges its intervals on the Tony Todd method of short working times with short resting intervals. The fact has been ignored in considering night as the convenient sleeping-time that it is also the best, since the working hours can then utilise sunlight, which, apart from giving us the advantages of a diffuse illumination, which our modern artificial lighting so conspicuously fails to do, is also definitely stimulating to all the active metabolism of the body. Having again remembered that no meal should approach nearer any brain-worker's sleep than three hours, we must now dispose of the extremely important question of the bedroom and bed.

The Bedroom

When one has slept and suffered in that abomination of so many Scottish lodgings in Edinburgh and Glasgow, the bed-closet, a tiny chamber opening from the sitting-room, there is a distinct temptation towards eloquence over the glories of light and ventilation. But when it is also remembered how many vigorous men have spent their nights in similar abiding-places, and emerged from its recesses in the morning with the vigour of the proverbial lark, prosecuted successful studies through the day, enjoyed their nights in proper student fashion, and finally have lived long and died happily, then the eloquence falters and dies. Some of the most vigorous men I have met have never slept with their bedroom window open. This is a concession to fact. Still if they have not suffered, as in common decency they ought, it is satisfactory to feel that they thrive in spite of their habits, and to know that one's dogma is sound, since it teaches how to avoid the risk of any such suffering.

Similarly, one may point to the household cat or dog—sanitation not yet having expelled these from the home—and observe its nose and mouth buried deep in its fur or hair, in the apparent endeavour to secure that any air breathed shall be contaminated to the greatest possible extent—which is another fact to be conceded. And many a man in his attempts to sleep has finally buried his head deeply beneath the bedclothes, and sometimes at last attained the required rest by this procedure.

Neither man nor dog nor cat, however, when once the sleep is fully entered on, preserves this attitude of semi-asphyxiation. The convulsive movements promoted by too much carbonic acid in the blood soon succeed in liberating the man's head from the clothes; and in the case of the animal, a movement of only an inch or so is sufficient to clear the nostrils. So that, while if you choose, this manœuvre may be regarded as a method of wooing sleep, acting in the same direction as the anæmia of the brain in preventing too much oxygen reaching it, it cannot from even these examples be taken to prove that the whole of sleep should be spent in the same fashion. The closure of the petals of flowers must be left to the justification of the botanists, though it must be confessed it seems very wrong of them.

Why, then, this pother about the open window and the need of ventilation, which *a priori* should retard sleep by keeping up too steady a supply of that oxygen of which it is the chief concern of the body to limit the quantity then reaching the brain? It is not the primary object of ventilation, however, to renew the oxygen of the room: there is ample oxygen in even the average stuffiness of an English bedroom when the night's sleep is over. Nor is it, as popularly imagined, to clear out the immense accumulation of carbonic acid, for neither does this reach to anywhere near the danger-point. The object

aimed at in the constant change of air is to eliminate certain organic impurities exhaled from the sleeper, which indeed are poisons ; and further to attack various organisms, particularly the bacillus of tuberculosis, which are unable to flourish in pure air. The carbonic acid of an inhabited room is valuable chiefly as an indication of the amount of organic impurity that accompanies it, the proportion of the one suggesting the proportion of the other, which is less easily directly measurable. To bad ventilation was probably due the frequently noted unsociability at the breakfast-table of a passing generation, as well as other bad habits.

The essential feature in deciding the size of a bedroom depends upon the fact that one thousand cubic feet of air is the proper amount for any sleeper, and that this amount requires to be changed every twenty minutes : more frequent changing can do no harm, but would render it difficult to avoid draughts, and draughts are to be avoided in sleeping-rooms on account of the warmth and large quantity of blood in the vessels of the skin with its consequent greater susceptibility to chills. Expatiation on and elaboration of the various methods of ventilation is superfluous : there must be a window, and this must be open top and bottom, entrance and exit being thus secured even in the lack of a fireplace. The device of a lower sash which projects higher than the lower edge of the upper, or of the ordinary sash raised by several inches of board, so that the same interval between lower and upper sashes is secured, is occasionally valuable. But, however obtained, the air of the bedroom must approximate as closely as may be to the outer air.

Probably, as our French neighbours have it, it is forcing an open door to explode once again the night air bogey, for night air is night air whether in or outside the room ;

and air at any time in England is harmful only by reason of what man has added to it. From the fact that chimneys, furnaces, and fires are less active during the night, and that the streets are not so tormented to dust, the advantage indeed lies on the side of the night : it is as needless to add that there is nothing subtly dangerous in the light of the moon or stars. A protest should, however, be emphatically registered against the action of those extraordinarily fatuous bodies which control so much of our municipal life, and which in their wisdom send huge sweeping brushes round the dry streets of the city, and impregnate the air of adjacent suffering bedrooms with filth that is unspeakable. Better the closed window than this!

Whether windows should be covered with blinds to exclude the light must vary with cases, since some could not get sufficient sleep, in summer at any rate, without them, though the ordinary mechanism by which normal waking is ensured is the gradual increase of light stimuli. Curtains belong to a different category, the presumably ornamental, and there need be no hesitation in condemning them. The rational bedroom will contain nothing that is not essential : neither furniture, hangings, carpets, rugs, pictures, nor ornaments ; and, especially, the space beneath the bed will not be utilised, as it so often is, by people who might know better, as a lumber-cupboard. Valances must go along with the rest ; they are simply dirty. It is probably not necessary to say that no sink or water-closet should be in the room. The walls and ceiling (*why* should a bedroom ceiling be white?) if papered must be washable and frequently washed—a favour usually accorded for some occult reason to only the floor—and of a cool blue or grey colour. The object of these revolutionary demands, as it is to be feared some of them may be thought, is to ensure that there shall be

no gathering-place for dirt. A stuffy bedroom is simply a dirty bedroom. Curtains round a bed or bedhead are anathema; draughts must be avoided otherwise than by these.

If at all possible the bedroom should be the best room in the house, and the one which receives most sun. Few people spend as much of their lives in any other room, so the best will naturally be chosen for this purpose. Tubercle bacilli die after a few minutes' exposure to sunlight: *verb. sap.* We need not press the connection of fresh air and immunity from tubercle further. One point remains, regarding the shape of the room, but there is little chance that the speculative builder will act upon this for a few more centuries. The room should, for the best, be oval or rounded with no single angular joint anywhere, even where floor and ceiling meet the walls. Consult any book on public health, and the value of such a form is obvious: for in even the best-ventilated rooms the air in the depths of corners is sluggish and changed, not by the currents of air, but by gradual diffusion: and in such corners organic matter and its faithful attendant bacilli are bound to congregate. No gas must be left burning during the night, and if warmth alone is required it can be obtained from electric radiators, although a good fire in the ordinary grate will secure this as well as assist ventilation. Gas stoves, &c., are not desirable.

The proper place of the bed is in the middle of the room: certainly not against a wall, which by such an arrangement receives far more than its fair share of contamination. The floor on which it stands will fulfil its purpose best by being of polished wood.

Of polished wood or metal, also, will be the bed itself, which ought to be single. The presence of more than one sleeper naturally concerns the size of the room, which must increase accordingly, on the basis that one thousand clear

cubic feet of space have to be allotted to each sleeper, though the increase of space need not be accompanied by additional height: in fact no advantage is gained by having any ordinary room more than 12 ft. in height. The ordinary hair mattress, based upon the usual spring foundation, forms an excellent material for rest, and to correct the inequalities of the mattress and to add to the comfort a blanket, covered by an absorbent sheet, completes the foundation upon which one can best repose. The sheets, as said, should be absorbent, which, it is needless to add, the ordinary cotton or linen articles are not. The superincumbent bedclothes must be adjudged by the necessities of the sleeper, so long as they are the lightest possible consistent with warmth. It has to be observed that all bed materials ought to be framed on the same principles as guide us in the choice of ordinary clothes: warmth, lightness, and ventilation are the desiderata to be considered. Feather beds, flock or wool, are not desirable. They are more difficult to persuade to levelness and are usually more or less insanitary—dirty, if the word be preferred. It was estimated only recently that certain flock beddings contain more bacilli than are present in sewage!

In selecting a bed, length and width are considerations not to be neglected: every tall man knows the acute discomfort of too short a bed. And as regards width, that is correct which will take most of the weight of the bedclothes off the sleeper, and yet permit of a considerable amount of ventilation by his movements. Fixing of the clothes at the foot of the bed is a necessity for comfort, but in England it is seldom essential that these should also be tucked in at the side to form an absolute sleeping-bag, if they can be maintained in their place otherwise. In this connection a common fallacy, called "airing the bed," demands comment. The usual practice is for the

bedclothes to be thrown back by the sleeper when he rises and for the bed to be made as soon as possible thereafter. That is ridiculous. The time to "make" a bed is immediately before it is required, and the time to air it is the whole of the rest of the day. And so to bed, as Pepys would have expressed it.

The bed is, however, unfortunately, not always all that is needed, and the methods of wooing slumber are innumerable. Some are simply silly, as, for instance, that which supposes the head to be a storage battery of electricity, from which the excess, which is maintaining the wakefulness, may be drained by putting the hand to the head, the hand acting thus as a conductor. But silly or not, the main thing is to have faith in any one of them. There is much in the value of suggestion, and Dr. Schofield tells of people who find it sufficient to place sulphonal or some other hypnotic by the bedside: its presence being sufficient though its absence would lead to insomnia. There are those who pin their faith to counting mentally an innumerable succession of sheep jumping one after the other over a hedge. Others count, or try to do so, up to a million. What is aimed at in all is to produce that state of brain anæmia, with slower heart beat and respirations, general muscular relaxation and skin warmth which distinguishes sleep. And if it be not foolish to add to the tricks enumerated, it may be said that deliberate relaxation of all the muscles, noting especially those of the face, with an attempt to imitate the rhythm of the breathing of sleep, is occasionally of assistance.

When the cause of the insomnia is an undigested meal, the remedy is obvious; if it is brain overwork or too strenuous a use of the eyes, the recognition of the cause will suggest its own cure. If the skin surfaces are cold, and in fact, for most simple insomnia, the best remedy of all is a complete warm bath, or if that is not attainable

warm sponging ; this dilates the skin vessels which play so important a part in healthy sleep, and at the same time soothes an immense number of cutaneous nerves, and helps greatly to produce the sense of organic well-being so necessary for the healthiest sleep. Emotion, it need not be added, is a prolific cause of sleeplessness, and there is worse counsel than that which enjoins that the last half-hour or hour of the day is best spent in quiet meditation.

An occasional contributor to disturbed rest is faulty position : the head may be too low or too high, but this is easily regulable by the height of the pillow, which of course must be of the necessary firmness though not too hard, to maintain this height when once it is decided upon. The question, however, as to whether one sleeps best on the right side or the left, is, or ought to be, merely a matter of habit, for sleep should be equally easy on either. When it is not so this may be due to slight errors of digestion, as a consideration of the relative positions of the heart and stomach will explain. The stomach is to the left and behind the heart so that if by any mischance it be dilated with gas, then when repose is sought on the right side this will tend to throw the stomach still more completely over the heart and affect it, the sleep, and the dreams accordingly. In that case turning to the other side may be sufficient. Or there may be cases which the contrary will relieve. Sleeping on the back is not usually successful, as is readily understood from the position of the great ganglia and nerves, which will be most pressed upon by the stomach and viscera falling back upon them. But whatever the position, that is best in which sleep is best, and that fallacy need not be heeded which says that curling up in bed, for instance, will lead to deformity. Decidedly those attitudes are to be avoided in which pressure upon the great arteries or nerves must occur : they naturally lead to crampings, coldness, and other

irritations. But there is little danger of any permanent deformity, such as curvature of the spine, as is at once clear when it is remembered that in sleep all the muscles and ligaments of the body are greatly relaxed—a very different condition from that which would result if they were firmly fixed.

The dangers of insomnia may be read in the faces and physique of those suffering from it, and also, unfortunately, in the asylums of the country. It is within the power of every one with the ordinarily healthy body to ensure that he also may not be a victim, or if he is he may rest assured that he has disregarded some simple fact among those enumerated. Drugs I have no intention of recommending. For this purpose they are as truly edged tools as alcohol. One fact is left to the last: that two hours of every day should be devoted to the open air, and that these two hours will best be spent in walking. Nothing has been said of the need of congenial companionship, though this is of importance: for it cannot be well for any one to regard his fellow-creatures as "ships that pass in the night," a misanthropy that will inevitably react upon his comings and his goings, his happiness and his slumber.

It has not been possible to consider this part of the subject in the spirit of other than scientific truth, though such poetic fancies as the Cornish legend that butterflies are the souls of sleepers might well have tempted to lingering. Rather has been justified the eulogy of Cervantes that "Sleep covers a man all over like a mantle. It is meat for the hungry, drink for the thirsty, heat for the cold, and cold for the hot; the current coin that purchases all the pleasures of the world, and that levels the king and the shepherd, the fool and the wise man." Though, indeed, all that has been said at even this length is better expressed in four familiar words, "Tired nature's sweet restorer."

CHAPTER III

BATHS

All-the-year-round bathers.

The Cold Bath.—Is not universally suitable—Not a cleanser—Proper employment and its physiological virtues explained—Its value is usually in inverse ratio to its length—Why the skin must be washed—Fifty ounces of perspiration daily—Skin well protected by keratin and the shape of gland channels—Sebaceous openings are the vulnerable points—Skin-gilding fable—Loss of heat from skin at different temperatures of bath—Sebum chiefly necessitates cleanliness—Friction.

The Warm Bath.

Variations on Hot and Cold Baths.—Douche—Sponging—Shower—Needle, &c.—Turkish baths—Warning.

Suggestion for School-children.

Bathing.—The secret of salt water analysed—Time for bathing—Duration—Nothing occult in sea-water to prevent colds.

Medicated Baths.—Dr. Johnson's opinion—Radium—Electricity—Dust—Sand—Mud—Peat—All act by friction.

The Common Cold investigated.—The omnipresence of harmful micro-organisms—The ordinary condition of the body is a balance between attack and defence—Where colds arise—The bacilli concerned—Quinine.

THE philosopher who has stood in the biting fog of a London winter morning, and seen the devoted one or two or three who brave the chill delights of a morning dip in an icy Serpentine, will not that day lack in material for meditation. By this stern worship of the goddess of health may be recalled the powers of the wonderful waters of Lourdes, and its equally wonderful pilgrims; the marvels of Ganges, the mother of waters, and its myriads of dark-hued bathers; while the imagination

may travel even to the sombre and mysterious powers of the Stygian stream, or the miraculous waters of Lethe. Curious the fascination, and the phantasies that have played and evolved round particular volumes of this monoxide of hydrogen: H_2O , as we curtly write it. To it we owe our naiads, our sirens, our water gods and goddesses. England itself was founded by the waves. By water we chiefly live, and of water are we mostly made. After all there is more than a superficial fitness in the test by water that has been applied to themselves by Englishmen.

This, however, is scarcely the path which has been travelled by the ordinary Englishman in arriving at the decision that the cold dip is the best way in which to begin the day. His reasoning has, it is safe to say, been purely empirical, and while it undoubtedly possesses that value common to all induction of which the facts are accurate, it equally shares the weakness of most empirical reasoning in failing to include all the facts. The cold bath does not suit every one: this admits the implied major, while it rejects the universal application. It may be that certain Spartans would commend it all the more as a means of weeding the weaklings, but we do not judge from such a primitive basis now.

The function of the matutinal cold bath is in the least degree that of a bath: the feature which commends itself to the user, commender, and bigoted proselytiser, is its coldness: the water is merely the accidentally convenient medium for applying this. This differentiates the cold bath from every other, since the main purpose of these depends upon the water and is summed up in the word "cleanliness." Be it remembered that we are here considering the baths of value to the healthy. There is little fear that any one will argue too greatly for cold water as a cleanser: but should there be such a one he will do well to examine his skin carefully

before and after the chilly fluid has passed over it. If then he still argue, he belongs to the class of those who imagine that a toothbrush is all that is necessary to cleanse the teeth. It is not for a moment denied that certain apparent blacknesses, and very considerable uncleannesses may be removed, but the difference between this and actual cleansing may be fitly compared to the results and satisfaction obtained by shaving with cold instead of with hot water.

Let this be granted, that it is decidedly well to apply water to the whole body as soon as possible after rising in the morning. And this may also be granted, that the colder the quality of this application that can be made with benefit thereafter resulting, the more vigorous is the health of that fortunate individual likely to be. The important qualification of this statement is that concerning the after-resulting benefit, and it is by this that the suitability to any special case of the cold bath must be judged. There are people in whom the desired reaction and delightful afterglow can only be obtained by preceding it with a warm bath, and there are others in whom the cold produces nothing but harm. By its fruits shall it be judged.

The physiological reactions in virtue of which the cold bath has value are these. A preliminary contraction of the skin and its blood-vessels, accompanied by a shallower respiratory movement, a slower pulse and circulation, is quickly followed by flushing of the skin, a deeper breathing, fuller and more forcible pulse, and an increased intake of oxygen accompanied by increased output of carbonic acid: of definitely increased metabolism or active vigorous life, in fact. The activity of every organ in the body is beneficially stimulated, and whereas the initial cold dip was only a matter of a minute or so, the reaction may persist for several hours. That is what should occur, and if it does not there is not immediate reason for deciding that the treatment is unsuitable. For an extremely common

mistake is in the length of time spent in the water. Shorten this to its minimum, and assist the reaction by vigorous towelling, before rejecting finally what is in reality an extremely valuable stimulant to those for whom it can be made suitable. If this fail it is well to consider whether the temperature of the water selected is not too heroic for a first trial. By beginning with a temperature only just below that of the body, and lowering it a degree or so every morning, there are many who can arrive at that of cold water with ultimate benefit. Or by a preliminary warm bath and with similar care in the graduation of the coldness of the after douche or dip, the desired hardening may come.

The man who in defiance of nature persists in his cold bath, though ten minutes after he is still shivering with chattering teeth and livid lips, nose, and ears, is, in blunt Anglo-Saxon, an ass. It is true that even he may by sheer doggedness finally attain to a condition of less than discomfort by persistent practice, and indeed may in the long run come to like it and obtain good from his experience ; but he is better advised to try the simple method suggested above, since the way of the martyr is not in this the best and he is doing himself actual harm. In general, the value of a cold bath is in inverse proportion to its length.

There exists something more than an impression that the deleterious matter which has chiefly to be removed in the cleansing of the body is the result of accumulation of sweat products. This is, however, scarcely accurate, for the constitution of healthy sweat is very far removed from that of a dilute urine, as it is usually supposed to be. Normal perspiration differs from the secretion of the kidneys in almost every possible fashion, except that in each the principal item is water. But the water from the kidneys is there for its efficiency as a solvent and convenient vehicle for the various harmful solids that must be removed from the body

for it to remain normal. The water of perspiration is the essence of its existence, and is valuable on account of the readily equable temperature that can be maintained by its greater or less evaporation: the solids in perspiration are in exceedingly trifling amount, are to a large extent re-absorbed in the skin glands even when excreted by them, and would not of themselves necessitate much attention to their removal. Further, the method of production of the two is entirely different, the activity of the sweat glands depending chiefly upon the control of nerves, while that of the kidneys is affected mainly by the conditions of vascular supply: the flushing of the skin which is usually noticeable in profuse sweating is an accompaniment and not the cause. There is, however, an oily element derived from the sweat glands which by some authorities is considered to have the chief lubricating function for the skin; and in such places as the palms, where there are no other oil-secreting glands, there is yet ample lubrication by this secretion.

The amount of perspiration is in no degree measurable by what is actually seen. The evaporation of water from the surface of the body is constant and takes place chiefly from the mouths of the tiny sweat glands; thus the visible beads form the least amount of the fluid that is incessantly being converted into gas. The total amount which is so changed during the twenty-four hours from the skin of a healthy man is probably about fifty ounces, and as the specific gravity of the liquid is 1004 (water being reckoned as 1000), the total solids contained in this for the whole body can evidently be only one-fifth of an ounce, these containing traces of urea and proteids, sodium chloride and other salts, fat and fatty acids.

The little channels by which the sweat is carried through the skin are corkscrew in shape, and in addition to this device—which must render it more difficult for noxious matters on the surface to enter their open mouths

—the constant and considerable flow of such an amount of fluid as has been indicated will act in the same direction. It is, in fact, not by the sweat glands usually that the skin is liable to infection: and the skin generally, since several layers of its superficial cells are converted into an impermeable horny substance called *keratin*, is equally well guarded. The normal skin cannot absorb water or anything contained in the water. Though iodine, guaiacol, turpentine, and other materials can be shown to have entered the organism after mere skin applications, they do so by destroying part of the horny layer and so breaking down the natural guard. The electric bath is, however, efficacious at its positive pole in obtaining the desired ingress of medicaments. But even mercury vapour baths cannot carry the metal through the outer layers, and their effect depends upon inhalation by the lungs. The assailable spots—as is evidenced by every boy who is suffering from acne, or “pimples”—are the openings of the little glands which secrete fat at or beside the point of exit of the hairs, a consideration to which we come directly.

But before leaving the subject of the sweat, it is as well to destroy once more a fallacy that has existed for centuries enough. There is a pathetic story of a little child who, in order to dignify an ancient Papal procession, was gilded all over, and otherwise decorated in harmony with the taste of that time, to represent a little angel: as a result of which gilding it is said that the little child died—the idea being that by complete suppression of the sweat he was poisoned. Now, unquestionably, you can perform precisely the same experiment with a rabbit, and if you varnish its whole skin it also will die, just as it will if you shave it all over. The cause of the latter death, however, is cold, as may be readily proved by keeping the animal warm, when it will live. And to that must be attributed also the result of the gilding, if it occurred. The covering

of the whole skin with an impermeable layer will do no harm otherwise, and of this, fortunately, there is human proof: since for a particular skin disease a patient was coated from head to foot with tar for days or weeks, and so far as life was concerned nothing happened.

The skin is not the potential instrument of destruction it has been supposed, if—and this is the salient point in connection with bathing—it is not allowed to lose heat too rapidly. To apply this more directly as a warning to those who favour cold baths, it may be mentioned that Liebermeister has estimated that the heat loss from the body immersed in water at 86 degrees Fahrenheit is double the normal, at 77 three times, and at 68 five times: what it will be in ice-water the enthusiast interested may estimate for himself.

In the "sebaceous" glands of the skin, associated with the hair, and concerned with the secretion of *sebum*, a material consisting of fats and fatty acids, there exist, in the case of clothes-wearers like ourselves especially, an infinite number of vulnerable points, and the major part of the processes of cleanliness is unconsciously directed to their protection. It is well known that the vigorous application of an ointment to the skin will serve to carry through it the particular drug which it is desired to utilise. The size of many bacilli, and that of the particles of the medicine employed, are not at all incomparable, so that if in any skin there exists an agglomeration of bacilli at any point, or at any rate their toxins or secretions, and at the same point there is a collection of unremoved sebum, then there is at that point what is for all practical purposes a most undesirable ointment. Add to this the constant friction of the clothes caused by the innumerable movements of the body and the last essential for skin absorption is supplied. Wherefore clearly to avoid the effects of such absorption it is not desirable to allow the

settling down of organisms, the dirt containing them, or the sebum which affords them such an admirable nidus. From this there is readily derived the scientific basis to justify the gospel of cleanliness. Dust or dirt modern man cannot avoid, nor can he prevent the secretion of sebum, but the removal of accumulations he can ensure, which means a daily cleansing bath.

Friction alone will remove, though it may also rub in. Cold water, tending as it does to the firmer coagulation of these fatty materials, is far from being ideal, so that the value of the warm bath emerges to clear view: and if the proper time of the cold dip, as indicated by its effects, is the commencement of the day, then as surely the best time for the cleansing operation will be at the end of that time of burden and heat, as well as for the soothing assistance it lends to sleep.

The temperature of the warm or hot bath must be adjusted to the frequency of its occurrence, the particular object for which it is intended, and the resistance of the individual. Certain foolish people take their bath so hot that it actually threatens them with heart failure, as can be well imagined from the great dilatation of skin vessels and the accompanying drainage of the blood from the brain, which rules the heart. Its action is in the direction of retarding all bodily processes, a fact which demands that it be not taken immediately after a meal: but in addition it is extraordinarily effectual in relieving spasm of muscle, whether voluntary or involuntary; a point to be noted in connection with cramp—whether of the limbs, in which the muscles are voluntary, or in colics of any kind, where the disability is on the part of involuntary muscular tissue, as in the bowels, heart, or stomach. From this effect of soothing heat are derived the advantages for such seizures of hot fomentations, poultices, &c.

On account of the profuse perspiration that is induced by the effect of the heat on the nerves of the skin, it will evidently be well to follow up the hot bath by an immediate retirement to bed, which will thus serve as the cooling-off chamber of a Turkish bath. The value of such a bath, which itself produces anæmia of all the internal organs, and especially the brain, must clearly tend to the production of sleep, in which, as we observe elsewhere, the brain is anæmic. The usual tests regarding intake of oxygen and output of carbonic acid prove the statement that has been made concerning the reduction thus caused in bodily metabolism.

As regards the various apparatus used to facilitate the purifying influence of the hot water, it may be deserving of mention that the sponge becomes very soon, if it is thoroughly used, extremely dirty, a large part of the bacterial *débris* from the skin, as well as collections of inspissated soap, becoming almost ineradicable from its substance; and there is no radical objection to the supplanting of it by the hands themselves, whenever and wherever they can be employed. For those, however, who would not take kindly to washing without some assisting appliance, a better article is a loofah, or some such substance, which can be thoroughly beaten out afterwards; but the best of all is a piece of rough towel, which can be thrown away after each using. Rubbing, in the case of the hot bath, is an essential part of the process: here it differs from the cold bath, in which the benefit is actually derived from the chill impact, though the reaction may need to be promoted by friction. The consideration of the kind of water or soap most suitable can best, perhaps, be undertaken when we discuss the care of the skin.

Under these two main classifications of hot and cold may be grouped the innumerable variants of bath that

are attainable in even the ordinary home, in the one heat being rapidly discharged from the skin, and in the other as rapidly added, with corresponding results on metabolism ; and whether the bath be entire or local (as foot baths, sitz baths, and so forth) the results correspond accordingly.

The cold douche, like the hot, is similar in effect to the mere plunge, either is perhaps more serviceable as it is more convenient ; which is the more drastic will depend upon the circumstances. "Indifferent" baths, as those are termed in which heat is neither added to nor taken away from the body, are valuable for sensitive subjects, and act usefully as sedatives on muscles and skin nerves, benefiting the organism, therefore, on this account. The indifferent douche will naturally be similar in effect.

Sponging is an adaptation to circumstances or cases, and takes its more gentle effect from the temperature of the water employed. Its convenience need not be enlarged upon.

The shower, the needle, the Scotch, and other douches, with a variety of elaborations, depend yet at bottom upon the distinctions that have already been made clear regarding the effects of cold and heat, and in the best results are tonic and invigorating. What has been said regarding the cold bath will *a fortiori* apply to the cold shower, or to the needle douche, or to the so-called Scotch method, in which alternating hot and cold sprays are directly and vigorously darted at the body. These are refinements for those who care to amuse themselves, and are not necessary in the preservation of ordinary health.

Turkish and vapour baths, however, are regarded by some as almost essentials. The Turkish bath, as that in more popular vogue, has without doubt its value, though it is as little essential as is, for instance, porridge at breakfast. The fact of interest in the Turkish bath

is that by means of it a temperature immensely higher than that which could be borne in hot water, can be sustained by the body in the hot air without disaster and indeed with benefit. It is understood, of course, that ordinary precautions are exercised and that no one who is not accustomed to this treatment will at once, out of sheer bravado, enter a chamber with a temperature of 180° F.: if he does so, the chances are that he will pay for his folly with a fainting-fit, or even further endanger his life. The beginner will find 130-140° F. quite high enough to make a start on, and will not linger unduly in even this. The effects are those of heat simply: the internal anæmia and the skin flushing, profuse perspiration and general lethargic sense of well-being. This is a condition that must be followed by the properly graduated cooling douche and a lengthy process of cooling off, from neglect of which latter alone arises the catching of chills for which the bath is sometimes blamed. The effect in suitable subjects is in the highest degree beneficial.

Vapour baths are the less commendable and the less necessary, since by their approximation to the effects of water, they do not so freely permit of such evaporation and consequent liberation of sweat as obtains in hot air. The "Russian" is the type of this variety; in it a temperature of 145° may be attained, and in its home it is followed by flagellation with twigs and an ice-water douche or a roll in the snow. The procedure of the Turkish bath, as it is carried out at Harrogate and other towns which live by their baths, may be of interest: preliminary warm shower or needle spray, followed by the hot air exposure in three different chambers; then a vigorous shampooing, soap and water lather, a tonic needle douche, and lastly the final plunge before the cooling off: a luxurious process evidently.

To turn for a moment from the consideration of these

various luxuries to a very practical point: thousands of children in every town go without even one complete bath from one year's end to another, and it is worth considering whether—as suggested by Mr. Rose in a paper read before the Medical Officers of Schools Association—along with every swimming-bath made available to such children, there might not also be a complete equipment for warm douching. Shower baths are recommended as being the quickest, cheapest, and most cleanly where large numbers have to be catered for. In this matter the most advanced municipality in England suffers from comparison with many towns abroad, and there is little doubt that if the advantages of the warm shower have to be balanced against those of swimming-baths on account of considerations of space or expense, the decision should be made in favour of the former for reasons not only of cleanliness, but health.

Bathing has points of interest of its own. Its ideal form has come to be considered that which occurs in the sea. We shall let pass the obvious temptation to say that this depends on the sea, and shall equally hasten to omit the too minute particularisation of various bathing-places that repute themselves to offer sea-water for the purpose. It may seem a cruel thing to do, but science demands that no enchantment shall be allowed to linger where it cannot be justified. Neither the ozone nor anything else equally subtle is responsible for the value of this pleasant and health-giving diversion. The effects produced are, so far as immersion is concerned, simply those of a heavier water, in motion, and containing a certain quantity of solid material, either suspended or in solution. The stimulating effect of the impact of innumerable infinitesimal material points is precisely that obtained by the whip of the wind when one is driving a speedy horse or motor-car. Here the subject might

be dismissed, were it not really necessary to point yet once more to the effects on the body of cool or cold water, and from these to indicate definitely that three hours after breakfast is the ideal time for a dip; certainly not immediately after a meal, and equally certainly not before breakfast. In both cases the need of the digestive organs for the first call upon any available vigour is clear. Nor is it well for any one in a state of too great heat or excitement to send fresh fuel for its aggrandisement by the rapid cooling of his surfaces that bathing means, with a corresponding increase of the internal energising or combustion.

The point of importance in sea-bathing as well as any other, is not to stay in too long, even if swimming is superadded, which exhausts the energy of the body in its own way, while heat is at the same time being steadily subtracted by the water. It has to be remembered that though swimming will manufacture heat, it does so by draining muscular and so bodily energy. Sometimes occult and mysterious powers are attributed to sea-water in the way of the prevention of colds. This is, unfortunately, not confirmed by the facts. It is cold that gives colds—not water, whether salt or fresh. If this be doubted, the experiment of trying it in your bath with the similar carelessness that previously resulted in your catching cold is worth performing. You will settle the question, but you will catch the cold. Possibly the microbes—for there are microbes of so unconsidered a trifle as even a common cold—are fewer and less virulent at the seaside, and probably the life is more health-giving at such places than that led by the same people or children in town, but there is nothing miraculous in salt. It is irresistibly suggestive of the putting of salt on a bird's tail, this presumable lethality of sodium chloride, &c., to the *micrococcus catarrhalis* and company.

Of the great and glorious army of medicated baths, there is hardly any necessity to speak. They are inactive so far as helping their constituents through the skin is concerned, whether these be of soda, salt, pine, or other elixir: our opinion of them, indeed, is practically that which was expressed by Dr. Samuel Johnson with his wonted vigour: "No, sir: medicated baths can be no better than warm water: their only effect can be that of tepid moisture." Skin disease forms a different subject.

The extraordinary virtues of radium and electricity have naturally been inveigled to point the moral and adorn the tale of various enterprising spas, but of their action on the healthy skin in those minute quantities that concern water, wherever obtained, there is not a jot of evidence of the slightest value. Electric light, ozone, and sun-baths are deserving of some thought, and will receive attention when we consider the physiological effects of light. There is yet remaining, however, one group of solid baths that have been devised by the wit of modern man, though sometimes it is to be feared in imitation of long past and deservedly forgotten models—the most familiar of these being peat, mud, and sand baths. Indeed, none of these need trouble the healthy in body and mind. The sparrow of the streets is alive to the virtues of friction as obtained from dust particles in its vigorous dust-baths, but offer the sparrow a wet bath, if only of mud, and there is little difficulty in perceiving which is preferred.

Mud or peat bathing stimulates the skin by the friction of innumerable minute fragments of plants and other organic as well as inorganic material, such as sand and shells. The mud or peat is plastered on or applied in various ways, frequently hot, or as in taking an ordinary bath: being bad conductors of heat, baths composed of either of these substances may be made either hotter or colder than is

possible in water, without discomfort. The action is that of cold or heat with the increased stimulation of the skin by the particles contained.

The sand-bath is particularly stimulating or irritating to the skin on account of its composition: its particular characteristic is the dryness of the heat and the facility with which it permits evaporation. But to any of these phantasies must naturally be added the use of water afterwards.

With water, then, this subject began and with water it ends. The body must be kept clean for the individual to be healthy. If the cold bath suits him, he cannot do better than to pin his faith to this and follow his theory by practice. He is to recollect, however, that the *odor humanus* cannot be entirely removed by it, and that reinforcement by heat is not to be despised. Also the man who has reason for his disbelief in the efficacy of cold bathing in his own case is not, therefore, entirely contemptible. It may not be superfluous to quote in this respect the example of the Japanese.

The Common Cold

Though this is not a treatise which professes to do other than inculcate the ordinary observances by means of which disease, if it cannot indeed be warded off, may yet be met by the best powers of the body, there is one matter which is concerned very closely with the benefits to be derived from bathing, and especially cold bathing: this is the warding off of the common simple cold. Universal is, perhaps, the best term to apply to it, since it is doubtful if any one in England has not at one time or another come under its ban. It is a most powerful illustration of the truth that bacilli or the organisms of disease are always with us: and in the universality of colds is the amplest warning of the necessity to keep

the body continually fit. There is no need to remind ourselves of what a simple cold may lead to: the possibilities leap to the mind under the headings pneumonia, bronchitis, and consumption, to name a few only.

In the understanding, then, of what happens in this commonest of all affections lies the comprehension of many of the most serious risks which daily menace health. This subject enters also, of course, into the question of suitable clothing, but the ultimate intention of clothing is, after all, the protection of the skin, so that it may well be considered here.

Fundamentally all disease is a question of the condition of one's leucocytes, the white cells of the blood, or rather that portion of them which Metchnikoff has christened "scavengers" or "phagocytes." But the fitness of these useful agents depends, as might be expected, upon whether they are overworked or not. It is evident that if the skin is kept in good order, and is not itself a lurking-place of immense, comparatively speaking, areas in which are present innumerable hosts of those organisms which it is the duty of the phagocytes to keep out, that the latter will then be able to devote their attention elsewhere, and not be constrained to duty, so to speak, on this frontier: the saving of the energies of protection will therefore be proportionately great. But in the case of the maltreated skin, the reverse must obtain, and from the drainage of the phagocytic force to this the strength elsewhere must be impaired.

That, however, is not the only value of a well-cared-for skin: for this in the event of draughts playing upon any portion of its surface at once responds by a vascular contraction and a checking of perspiration—a mechanism which ensures that heat will not be too rapidly lost at that spot, nor the general bodily temperature allowed to drop. The actual cold spot, too, is a place where vital

energies are lowered, and an attack of bacilli is more likely to be successful.

In these different factors—the omnipresence and the ever-presence of hurtful organisms, the general chill of the blood from a defective vaso-motor response, the diffusion of the strength of the phagocytes, and the actual lowering in addition of the resisting power of any one spot or area of the body, lie ample explanation of the attack that is promptly and often successfully made by those organisms that happen to be most favourably situated. It must always be remembered that the balance of power between the body and its attackers is extraordinarily delicate, otherwise no organism could possibly find a permanent resting-place upon the surface or in the mucous membranes of the body. This continual presence proves clearly that the battle for possession is, in even the healthiest of us at all times, merely a drawn one.

The reason why draughts and chills cause "colds" is now clear. For if there is one place in the human body where organisms are most likely to be present in greatest number, it is the mucous membrane of the nose, nasal passages and back of the pharynx, since to this place are continually inhaled fresh accessions in the dusty air which it is the lot of modern man to breathe from morning till night. The natural sequence need not be further detailed, but if it is of any interest to name the special fungi which are each and all capable of giving colds, these are three in number—Friedlander's bacillus, the segmented bacillus of coryza, and the catarrhal micrococcus. The best preventive to have circulating in one's blood when the liability to colds is, or is likely to be, incurred, is that extremely valuable antiseptic, quinine, of which an efficient dose is two or three grains taken three or four times a day.

CHAPTER IV

EXERCISE, TRAINING, AND ATHLETICS

Norse and Greek physical worship—Physiology reconciles mind and body—Archdall Reid and development by exercise—Baby and amoeba compared—The "fidgetiness" of children a physiological necessity—From seven till puberty boy and girl equal—Precaution at puberty—Athletic and intellectual women *luxus nature*.

The basis of all exercise—"Going back to Nature"—Development of human locomotion—The other muscles affected—Free respiration essential.

Need of exercise shown from the food consumed—The instinct of "hunger" fallacy—The pathology of "John Bull" and Pickwick—A walk of eighteen miles—A housewife's exercise—Failure to build a reserve—The need and definition of the proper reserve of strength.

Training.—Temporary training is folly—Grecian athletes—Their diet, exercise, and death—Professional and amateur—Ordinary training—Training-off—If no "training-off" a waste of time and a danger—Staleness—Training is a lifelong matter—A wrinkle from America and Galen.

Methods of Exercise.—Walking—Town air no excuse for staying indoors—Games are as natural as walking—Ball-games founded in our development—Football—Team play—Muscular systems and not individual muscles the test of any sport or game—Women must match with women—Gymnastics better than bedroom athletics—"Second wind" and "stitch"—Summary.

A VERY brief study of the Norse mythology will reveal the extent to which the physically magnificent was worshipped by a simpler world than our own; and, in the feats of Thor, whether drinking, dragon-baiting, or hammer-throwing, may be read merely the glorification of muscle. The fable and myth of the northern lands was duplicated, with the modifications of time and space, in the religions of Greece and paganism everywhere. There

was an apotheosis through all the world of the human body. Omit the East and the wisdom of its Buddhas which less concerns us, and the swing of the pendulum from a purely physical worship received its chief impetus in the Christian era, and was carried to the other extreme ; so that it became laudable for the hermits and saints to torture, degrade, and mortify the body in order that the soul might the better be free. From the deification of the body to hating it was a not unnatural reaction in this rhythmic world. The oscillations of this last phase are still with us in the occasional more than half-implied belief that life is for work, and not work for life. To the thoughtful, however, of this generation, with their advantage of a clearer and more precise physiology, there is no longer an antagonism between the body and the mind, and it is possible to fuse into one harmony of teaching and explanation the truths which have had to be derived from the laboriously compiled data regarding both. Exercise, indeed, is chiefly valuable in so far as it helps to develop the psyche, or mind, so that we are still able to subscribe to that tenet beloved of Sir William Hamilton, which declared that "there is nothing great in the world but man ; and nothing great in man but mind."

By the training of a warped physical culture it is possible to grow a purely muscular body: by the entire neglect of such culture may be obtained a mechanism in which the more subtle element will appear to predominate: but by a judicious physical nurture it is possible to obtain both: and that is our thesis. Exercise is valuable only in so far as it helps towards "complete living," and by this Spencerian test of value must it be weighed.

Exercise, let us say, affects primarily the muscles, but not a muscle of the body can contract without affecting scores of nerves. There is not one nerve in the body

which does not have, or which cannot have, means of communication with the brain, as well as through these with the rest of the body. All mental processes are based upon a simple unit of action or process, in which some one muscle fibre is a chief factor. The absolute necessity to consider nerve and finally mind in any discussion of muscle, is therefore clear. There is no muscular hegemony among the principalities of the body, though various ardent physical culturists—notoriously disinterested—are endeavouring to inculcate it, and upon this point the tribute of Sophocles is still peculiarly apt:—

“Not always the huge size of weighty limbs ensure the victory.
They who excel in wisdom are alone invincible.”

It has been noted by Dr. Archdall Reid that the adult differs from the child principally as the result of exercise—the full development of the normal arm, for example, being a fresh acquirement in the case of every human being, and a development which would not have occurred had not the arm been used; and it is only reasonable to assume that such use cannot be pretermitted even when development has been completely accomplished: though it is equally reasonable to believe that the time and energy required for maintaining perfection is not likely to be as great in amount as {that required to produce it. There is here, then, little justification for that definite modern tendency to glorify the body, and to raise it once more to an importance of consideration directly comparable with that in which it was held in the golden age of Greece.

The question of exercise in the case of babies and young children is extremely simple. The matter is out of our hands if they are left alone. The amœba from the depths of the jelly-like soul with which Wundt

credits it, grasps at whatever pleases it: its means are somewhat ineffectual, blind, and groping, but by sluggish protrusions of its substance—pseudopodia—it makes distinct attempts to reach the object of its desire. There is no essential difference between the mechanism of this and that which prompts the infant to clutch wildly at its father's beaming eye. Salts in solution in the amoebic jelly are squeezed out; various tensions are altered, and the pseudopodia protrude: in this case the stimulus provoking the movement is declared to be of the nature of "positive chemotaxis." The rays which define an eye to the infant reach its optic nerve, salts in the jelly of the nerve are squeezed out, and as a result of the alterations of tension a message passes to the nerve cell. This continues the chain of alterations in salt fluids and repeats it along the nerves running out to the child's arm. The change is taken up with a variation in the muscle substance, the muscle material flows in one or more definite directions, and the baby's finger approximates more or less to the paternal eye.

The life of a child is the primitive life, where thought is promptly translated into action. This has to be understood, and should be written in letters of gold in the nursery of every home, that a child's liberty of action should be absolute except in so far as regards its own safety and that of others. Movement is the natural reaction to all stimuli in the very young: it is essential to their health, to their growth, and to their development and after these, it is needless to add, to their happiness. It must be seen to, then, that the movement of every part of the body from head to heel is wholly unrestrained. There is not a movement, not a single wriggle of body, head, or limbs, which has not its definite purpose, and in this is the explanation of that "fidgetiness" or restlessness which—as those older people who are worried by it

should begin to realise—is not a deliberate manifestation of iniquity on the part of children. The nerve currents induced by all excitation from the outer world in children are short-circuited to muscle: it is only in the more mature that they can diffuse themselves in those numberless ramifications of connections in the higher association areas, and ultimately almost die away without apparently having resulted in more than the production of a certain amount of heat and some little thought or imagination.

When a Balfour finds it necessary to relieve some of the superfluous brain energy by gripping the lapels of his frockcoat, or a Bannerman finds that speech requires the assistance of table-thumping for all his nerve-currents to be satisfactorily drained, there is little justice in chiding a child who spontaneously seeks an outlet for his emotions by kicking one's shins.

So let the children play, and do not put them in positions where the muscular outlet for their cortical storms shall be an inconvenience to others. Especially is the word "play" to be noted. A very young child should most decidedly not be "taught" games. It is to sit or stand or run or roll as seems to it best at the moment; and no considerations of clothes or dirt are to interfere with these primal necessities. The sensations are to be trusted, in this matter at least. Our new perception that the child is not a little man illustrates admirably Carlyle's magnificent dictum that a lie cannot endure for ever, and the life of this particular and pernicious lie has been short, though not short enough. There is another more formidably worded saying that comes nearer the truth: it runs thus: "Ontogeny is phylogeny," the translation of which is that in the life-history of the individual may be perceived roughly an epitome of the evolution of the race to which the individual belongs.

Perused by this light, the child at any age represents approximately an early edition of man, and the savage and barbarous instincts of most healthy children, as their actions would seem to exemplify, need not cause that chill horror of staid families if it is comprehended that the tendencies of a long-past Stone-age ancestor are being reproduced, and that this stage is a fleeting one. The child is far from being the father of the man, though he may be the grandfather to the Nth degree, and his needs are not those of his father.

A child is, in fact, not immoral, but unmoral: it is governed by instincts or by instinctive responses, and its needs are for the first few years chiefly those of the animals. As we are not here dealing with more of education than is comprised in the ordinary understanding of exercise, this question need not be further enlarged upon. It is clear that liberty of physical movement must rank with food, air, and light. To the child also it may be left to take full advantage of that permission: the sole exception being the case of the only child without playmates. That, however, is a misfortune which, when it unavoidably exists, should be remedied to the fullest extent possible by constant contact with other children.

The case of the child from the time it enters school-life till it attains the age of puberty is more difficult, for into this stage must enter largely the conscious discipline of mind and morals. When we have reduced to figures the amount of energy that may safely be yielded by any child of given weight, and when we have solved the question of the value in this regard to be attributed to the more delicate mental processes, then we shall be better able to apportion the tasks that must be allotted. It may be stated, however, with certainty that the differential treatment of the sexes is not demanded at this stage.

EXERCISE, TRAINING, AND ATHLETICS 59

If there is any difference between the physical vigour of boy and girl under the same treatment it is rather in favour of the girl, who attains her maximum more rapidly.

During this time also, however, from say seven to fourteen, the physical are the clamant needs, and apart from the time of direct schooling, which should not exceed four hours daily, the child's time and energy should be spent in games, walking, or other forms of physical exercise which will ensure healthy sleep, our only reliable test of a properly spent day. It remains for physicians to institute a really trustworthy series of tests of such sleep. At present it is necessary to judge by the body weight and by that vagueness termed "condition," whether life is being properly utilised—and these do not always react rapidly. There are readily interpretable symptoms in the grosser cases of unsatisfactory sleep, which should, of course, never be disregarded.

The age of puberty needs most careful watching. It is a time of most rapid development, being, in fact, second only to early childhood in the amount and rate of change that occurs, and it does not at all follow that a mode of life which has been perfectly suitable before this may be satisfactory now. Sleep, it has already been said, must be amply provided for. The ideal course would be that there should be neither school-work nor any other employment demanding mental wear and tear for a year around this period, and that life should consist of open-air occupation with that form of exercise which is most valuable in the special case—this being judged as before.

From puberty onwards comes a time when the sexes require a scientific differentiation of their treatment, based upon a recognition of the differences in their function and life-work. That there is a difference in even their reaction to the same course of physical training is perceived by

the teacher of gymnastics, for no physical training will induce the rounded muscles of women to take on the knobby character which is so great a glory to men. This variation is significant of a separation between the sexes. Women are conservators of that energy which it is the function of man to disperse.

Woman, indeed, is anabolic or energy-retaining, while man is precisely the reverse: and when woman disintegrates her accumulation she does so in perpetuating the race. It is evidently necessary that this should be taken into account in discussing the life of each. Clearly the athletic woman is, or should be, a *lusus naturæ*: and with equal justice may similarly be classed the intellectual woman, or she in whom brain or intellect, as we understand it, predominates. It is to the credit, then, of the sex that woman has not been renowned as painter, composer, dramatist, or writer in the history of the world. Yet by a perversion of all complete understanding this has been held her reproach, even though it has at the same time been noted that those women who have excelled in the forbidden paths of either mental or muscular robustness have tended to sterility of actual life. It has not been granted to be fertile in more than one world.

But whilst no man wishes to see an athlete among his women-folk, it does not follow that they should be debarred from participation in the exercises which make for health: and with qualifications usually only of degree these may well be the same for both sexes.

The solution of the question as to which particular muscular exercise, deliberately taken, is most likely to be conducive to health, may be decided in a variety of ways, and the answers are only likely to coincide if care be first taken to ensure that there is in each case the same understanding of what is meant by health. That matter has been settled, so far as this work is concerned, by our agree-

ing that it is the power to live completely—which means that all the desirable faculties shall be capable of their proper employment.

There is a phrase used often to settle such difficulties as this, and its users appear to imagine that when it has been said, all that is possible upon the subject has also been said. But though “going back to nature” is very probably a good plan, it is once more needful to exercise the primal logical discretion which advises a careful definition of terms, and to ascertain precisely what is meant by “nature.” For the Hottentot, the Central African negro, or the South Patagonian are all comparatively “natural,” yet there is not too striking a conformity in their habits: while if the natural as revealed in animals be understood, then which particular animal is to be chiefly favoured by our imitation, and on what grounds? Man’s nearest relative dwells in a tree—which excludes him at once.

The rational method would be, or appear to be, the going back on the history of man himself, discovering what parts of his muscular economy were first principally used, and inferring that these, if they still exist, should form a natural basis on which exercise should begin. Without too detailed an investigation of muscular man by this method, it soon becomes clear that the mechanism concerned in locomotion has always been and still is of first importance: and upon his capability of changing his position has been founded all human activity, while by its necessities have been modified vital processes, such as respiration and circulation, together with all other visceral development and function.

Of all the muscles under the control of the will those concerned with massive bodily movement have been most active for millions of years: they have maintained their value to well within our own times, and it is only now,

when man is able to travel faster on man-made machines, that there has arisen any doubt as to the parts of his body which first deserve attention ; though it is still realised that the back, loins, and thighs are the regions in which resides "strength." It is most certain that a bodily harmony which has evolved upon the call of the locomotory powers during hundreds of thousands of years, cannot without difficulty persist in face of the rapid and artificial change induced by man, which seems to require that this basis, upon which his whole anatomy has been modelled, shall be at once ignored.

Any system of exercise, then, which does not recognise walking and its companion, running, as fundamental, is bound to be unsatisfactory for muscles, organs, and brain : for in the brain are laid down one or two millions of entities, the interests and welfare of which are intimately concerned with the muscles of progression. There is infinitely more in walking than the mere contracting and relaxing of a group of muscles, a fact ignored by systems which tie the athlete to a series of rubber tubes attached to a bedroom door. There is a variation in the stimuli which meet the eye, ear, and skin in every step of a walk : there is a difference in the work done and the kind and worth of it. Could there be anything more absolutely artificial or farther removed from that nature to which a prominent advertiser assures the public that he wishes to restore us, than the contraction of muscles of arms or hands or legs while sitting at rest in one's chair, as advised by him ?

While the child is young it first wriggles along the floor ; later it manages to progress by bringing into play legs, arms, and body ; and, as evolution proceeds, arms and legs, and finally legs alone, become the preferred means of movement. The progress from the serpentine to the quadripedal and at last the bipedal form of loco-

motion is significant. At every stage more than the muscles immediately concerned are used: the crawling infant has extraordinary power in its neck muscles, enabling it to raise its head and look about—a natural compensation for the difficulties and necessities enforced by this position. The quadrupedal stage also brings into action abdominal, lumbar, and most of the other voluntary muscles. Nor when the erect position is attained are the muscles which actuate the lower limbs on this account isolated: there is a deep-seated understanding which, at every fresh posture of the body induced by the muscles of walking, provokes actions and reactions through the whole economy. It is hardly too much to say that in walking nearly every muscle—voluntary muscle, that is—of the body is actively promoting the motions aimed at, either by actual contraction or by passive resistance.

The more self-evident of the muscular actions that accompany the movements of the lower limbs are universally recognised, such as the opposite-sided swing of the arms, the movements of abdominal muscles, the contractions of those of loins and back, and the stiffening necessary to hold the head erect. It must be noted, however, that if the arms swing the shoulders also are concerned, that hence the pectoral muscles become involved; and that these play on the ribs and thorax. Any one with an elementary knowledge of anatomy may work the entire connections throughout the body. If there were no other method of forcing this truth home it could be done by taking the skin as starting point. For when as in walking, the whole skin is free to move or be acted upon over the whole body, the alterations of tension induced in it by so large a system as that of the legs must react superficially everywhere. No physical culturist who believes in the cold bath will throw contempt upon the possible influence upon the skin.

The vigorously acting muscular and visceral system acquired by such a method of exercise is of undoubted value, for instance, to the backgrounds of consciousness, since the stimuli from this healthy system give the proper warmth of feeling-tone to sensations, emotions, and ideas.

It is hardly possible to enter fully into the reaction of all the organs to this supremely necessary form of exercise. That it is the best method of producing "wind" and stamina is undisputed; this is recognised in every curriculum of training, whether it be for football, swimming, running, or fighting. It has been pointed out that there is a direct action upon the ribs by the muscles of the upper extremity, and this must influence respiration; but it is essential to observe that there is in walking no interference with the easiest and fullest breathing, since no forcibly contracting muscles are holding the shoulder girdle or the ribs or the diaphragm in any one fixed position. If you are an indifferent cyclist and endeavour to aid your difficult progression by pulling on the handle-bar, thus fixing the upper part of your thorax, the impediment to easy breathing will be at once apparent. For the same reason it is not right when doing dumb-bell or similar forms of exercise to stand with the shoulders well back, as is so curiously and universally prescribed. Stand up well by all means, but the muscles must be "limber," not set hard. This is easily proved by testing it.

The truth that no persistent violent exertion during which shoulder, back, or thoracic muscles are strongly contracted for more than one or two complete inspirations, is good for the organism, should be the test of value. By it weight-lifting, for example, is absolutely condemned. Consider the physiology of this. A work is entered upon which must absolutely clamp the chest, yet the inspirations attempted will be of the deepest. Air is being compressed

EXERCISE, TRAINING, AND ATHLETICS 65

in an imperfectly expanding cavity, with a proportionate influence on the contractions and expansions of an already labouring heart, while at the same time an excess of blood is being driven to that heart—the working of which is thus doubly impeded.

In view of the preceding, and admitting that exercise of any kind is necessary, it will probably be granted that walking or running is a fundamental method of obtaining the most good in the best way. But it may be questioned whether exercise of any kind is really essential. It has already been mentioned that the unit of human processes is one in which muscle is a factor, and that, therefore, care of the muscles must attend all care of the body. But there is another aspect from which the matter may be regarded, viz., from the amount of potential energy absorbed by man in the shape of food and air: it is evident that this must all be accounted for. If food is largely in excess of the needs of heat, body building, internal bodily processes, and actual visible work done, then the waste will be removed along with the excretions. If the food taken balances these needs there will be no waste, and that clearly is the ideal to be aimed at in feeding. If supply is insufficient this will be compensated for first by a diminution in the ability to do external work, or the actual structure of the body will be broken up and thrown into the fire to maintain the necessary amount of energy.

We have, however, in England attained to a vicious method of life whereby the actual amount eaten varies very little even in summer and winter—so that a man thinks if he is eating less or has less appetite than at any other time, he must necessarily be ill. That is, of course, very ridiculous and due to the three-meals-a-day cult, whereby the healthy hunger instinct has departed from us, and a factitious and deceptive hunger, meaning only an

absence of undigested material in the stomach, has taken its place. Digestion is not an affair of two or three or even five hours, as many seem to imagine. There is, indeed, no doubt at all that most of us eat too much and that the feeling we proudly aver to be "hunger" is nothing of the kind, and is due to a vitiation of natural processes by the pampering of the stomach—the sensations of which are, in civilisation at least, most untrustworthy guides to diet.

As a result, however, of the over-supply of fuel to the body, there is an enforced necessity to get rid of the surplus, or a risk of interference with its machinery. The pride of England in its so-called prosperous-looking national conceit of John Bull is the exemplification of how the disgraceful may well come to be the object of pride: the protuberant abdominal region of this figure is due to immense deposits of fat in the great omentum, a membrane intended to protect the bowels: fatty infiltration is the last thing on earth that either a man or a nation should be proud of. This is written with all seriousness. It is not said that the prototypes of this national figure did not exist before the cartoonist delineated him, but a pathological type has thus become a model to be admired and a type of figure by no means to be shunned by the middle-aged Englishmen, who find in this their sanction and justification. Dickens knew his public when he drew his otherwise delightful Pickwick. It is rather suggestive that it lay with an American to show that all the previous estimates of the amount of food needed to keep even the hardest working man in the fullest possible vigour and health were far in excess of the actual truth.

By the failure of a genuine hunger-sense and the glorification of a pathological anatomy, this discussion of exercise is unavoidably complicated, for in addition to keeping the body fit by its own proper attributes,

EXERCISE, TRAINING, AND ATHLETICS 67

exercise has come to be impounded to make good the effects of excess. Let this mention of such things be sufficient to indicate their existence and the fact that they are not physiological or harmless.

The question of obesity, therefore, hardly enters into the life of any one eating the proper amount of food and taking the due proportion of exercise, but perhaps the statement is worth making that there is no safe and effective "anti-fat" preparation. Thyroid extract in the hands of the physician has occasional value, but the best treatment is prevention, if the phrase may be allowed. The method of sweating down weight as pursued by jockeys in their Turkish baths and long walks with layer on layer of clothes is simply pernicious; while the Banting device of red lean meat food, though physiologically sound, should be unnecessary.

Our concern is with the organism that is not gluttonous or lazy, but whose desire it is to utilise its sources of energy to the best advantage of body and mind. Four-fifths of the energy available is required to maintain the body temperature at its mean of 98·4 degrees, and the remaining fifth that should be actually supplied in food and air is almost equally divided among the processes of bodily metabolism and the actual movements that may be measured in terms of the units of work. We may follow Dr. Cantlie's acceptance of the figure 300 as representing the output of foot-tons of work that must be performed for health maintenance in its external movements of all kinds by a body weighing eleven stones during the day. As is pointed out by him, such an amount can be realised by walking eighteen miles.

Such estimates are, however, utterly fallacious unless some stipulation is made as to the time over which this walking is spread, and also as to the speed at which it is taken. The sprinter in his 100 yards

exhausts energy that would carry him miles at a walking pace—he may even disable himself for life; whereas the housewife, who during the day is up and down stairs an innumerable number of times and who is otherwise almost continually engaged in a number of small progressions which would really seem to total to a fair amount of exercise, is often quite unable to walk five miles at a stretch without inconvenient fatigue. The time factor is of the greatest importance in creating a reserve of force, for those people who have accustomed their cells, muscular and nervous, to short outputs of energy are obviously doing little to build up that reserve which we know as stamina. A short demand upon the energy of any system does not mean that there is a correspondingly large stock still available. Where the demand is always small the available reserve is also small, and such reserve can only be built up by effort of a continuous character. An hour's steady walking is much more than equal to two separate half hours taken at wide intervals. It is never advisable to be in such condition that the last straw to complete the overburdening is within quite perceptible distance. The possession of a good reserve gives confidence and ease to individuals as well as to nations, and that exercise which is to build up the necessary reserve must be aimed at, so as to cover all the possibilities in the life of each individual. If the absolute limit to the call upon the physical powers could be foretold, then it would be easy to lay down the routine for any life—this would need to comprise a training which would make the limit of strain to be faced quite attainable by the body and yet leave something still in hand. Absolute prophecy of what such maximal strain will be is of course impossible, and the wise man or woman will adopt a system of averages and by realising what

EXERCISE, TRAINING, AND ATHLETICS 69

calls are likely to be made upon the bodily stamina, will frame a mode of life which will enable all of these to be overtaken without danger to the body.

The fact that the most urgent demand for stamina may occur only once in a lifetime does not affect the argument. It is to meet that one vital demand that the whole of life must be planned. Be it noted once more that this exception is yet to be from a wider view a quite average possibility, such as an attack of illness.

If by proper exercise people kept themselves in better training, we should not so often see a man of thirty or so turn white after the extraordinary exertion of running fifty yards to catch his car or train, and deaths from apoplexy and heart-failure would almost disappear. It is not needful that the ordinary law-abiding citizen should be in such condition that he is fit to fight for his life on equal terms with any prize-fighting rough of the slums, but it is decidedly desirable that he should be able to stave off actual murder by violence, for a minute or two at any rate, no matter how formidable his opponent. At such a time no theory will supply the exceedingly necessary "nerve," and the best ensurement of this nerve is to be in good condition.

Training

So that now has been reached the vexed question of training. It is the fact that every one should be in training, and that such training should be an explicit object of school-life. It seems almost too foolishly obvious to be worth noting in black and white that definite "training" for a week or a month or a year is of the essence of folly, but the statement would almost require to be made in face of the persistence with which training of this nature is still acclaimed as a worthy thing. The physiologist who watches a Harvard

and Cambridge boatrace must realise with a scientific pang that though it certainly is glorious,¹ it equally certainly is not right, and with a prophetic vision of almost X-ray intentness he perceives the hypertrophied hearts induced by the training, dilated by the race, uncared for after it, and a resultant death from syncope or apoplexy looming in the future—the choice of the two being dependent upon which has suffered most in the muscular saturnalia—heart or blood-vessels.

We are indebted for our ideas on the conduct of such modern Olympiads to the ancient example of Greece; but, be it noted, not to the best of Greece. The Greek athletes became a professional class, with whom, it is true, the ordinary citizen could not compete in the contests they specially affected. These athletes had their *Aleiptes*, who prescribed their diet and rubbed them down in the approved method of the modern trainer, though, in addition, he used oil which, to make the likeness complete, may be commended to the modern substitute. Diet in the earlier times of the athletes consisted mainly of wheaten bread, dried figs, and fresh cheese; such meats as pork, &c., were later additions. Their special exercise consisted of taming bulls, carrying heavy loads, lifting weights, bending iron rods, punching leather sacks of sand, and so on—a programme not so very far removed from that of the pugilist of our time. Like the pugilist also, their end was frequently by apoplexy. Their rewards, too, in spite of that interesting fiction of the simple glory of a laurel wreath, were quite comparable with a world's champion belt and its pecuniary accompaniments, or a "benefit" to a renowned cricketer or footballer.

There is no intention to cast any slur upon the "professional" as distinguished from the "amateur"; what is

¹ The evidence usually accepted in favour of rowing crews is Dr. Morgan's, and it is thirty-five years old.

wished to be enforced is that while the professional is probably the best method for the attainment of excellence of surpassing degree in any athletic capacity, it is not the best training for all-round life. In fact the professional is handicapped in life to just that degree by which he has ignored and treated it as one sport or exercise. The truth of this is readily demonstrable.

Take the simple case of a man in fair ordinary condition who proposes to win a sprint, steeplechase, jump, or what you will, and who to do the thing properly on the approved lines starts to train and allows himself six weeks for this training. At the end of the time he enters for his event and puts every last ounce at his disposal into a supreme effort. There is no need to be alarmist in any way over what has occurred. If that man has really "put all in" he has dilated his heart, which was already to some extent hypertrophied by his training. These are simple *facts*. The chances are that as soon as his event is done with he "relapses to his ancient mood," and eats, drinks, and lives precisely as he did some six weeks before. Now, without unduly labouring knowledge derived from physiology and medicine, that is a profoundly wrong course. The steps of those six weeks should have been carefully retraced in the way of exercise, food, drink, tobacco, &c., and in addition to this a special allowance of at least a week should have been made for the peculiar strain to which he was subjected in his actual race. That is all only the commonest of common-sense, and as a net result at the end of some twelve or thirteen weeks he would be precisely where he started. This time has, in fact, been wasted: and that is the best that can happen when any special effort is made of this nature in a life which proceeds afterwards as it has done before. When the careful training-off is omitted, less time is wasted but more harm is done, since the only natural method of

removing superfluous muscular mechanisms much in excess of the daily needs is by way of degenerations; and these occur. Truly his last state shall be worse than the first.

The lesson is obvious: if you want to race, race as you are, with no great revolution in your ways of life—making sure first, of course, that your mode of life is that which will permit you to race at all. This is borne out by the example of any healthy schoolboy as well as by the experience of some of the best athletes England has produced. The man who can “do his hundred in evens” without any alteration in his habits is a better “life,” in a technical assurance sense, than the man who, by vigorous training, can take a fifth of a second or more off this time. This, again, is not matter of theory: we are fortunate in possessing living examples to clinch the argument. I can summarise all that really needs to be written about training, in the modern sense, in a sentence from a little book on the “Athletics of To-day,” by Harold Graham: “The only training that a young man requires, who is in the habit of living a moderate life, is to avoid such known evils as spirits, tobacco, pastry, and new bread.”

Practice is a very different matter, and depends upon principles which are outlined in discussing “Habit.” It is required that the connections—nervous, vascular, and muscular—concerned in the special co-ordinations to be undertaken shall be made as readily and easily as possible, and practice, supervised with the proper accuracy, will result in the necessary ease or habit. It has to be noted that though habit can ensure an easily running machinery of the body, the greatest expenditure of energy is only made possible by the active interposition of the higher centres of the brain, by means of which extra nervous power seems actually to be poured into the working system.

Inasmuch as the actual condition of muscles is chiefly dependent upon the state of their nerve-supply, and as in addition all vascular arrangements are controlled by and dependent upon nerves, the nervous element is clearly the primary consideration. That "staleness" which is liable to arise from too prolonged or too vigorous a course of training is chiefly due to the inability of the higher nerve centres to reinforce the nerve streams in the practised system. It is, in fact, a brain condition, and is to be treated accordingly by stopping or breaking the monotony of exercise or diet and by allowing the products of muscular metabolism to be cleared out of the system by a judicious rest. Here, as much as in the discussion of sleep, must be emphasised the share of brain cells in producing fatigue, for long before lower centre, nerve, or muscle would protest, the condition of cortical cells inhibits action.

The value of practice, precisely similar to that of habit, lies in securing with the expenditure of a minimum of energy any desired movement, but though the constant repetition of a movement results in an increase of its power for a given stimulus, this increase of power is not progressive and can never hope to reach that limit possible to concentrated effort. This is why no mere perfection of form will suffice to win. However perfect the apparently automatic part of the body's action, the brain must also participate to secure the best results. No system of training, then, whether limited or lifelong, is likely to be successful which ignores the brain.

It must be carefully observed that training, as it applies to the whole of life, must comprise all that is contained within this book, with much also that is outside its scope and that may be found in other volumes of the series. There is nothing which bears on life that has not some effect upon physical efficiency, and while there have un-

questionably existed many individuals of magnificent physique and mental attainments who paid no conscious attention to such matters, ours is the case of a generation which requires more fully to understand, and to act consciously, since the times have changed, and if we are not to change with them to our disadvantage, it must be by the deliberate action of volition. As illustration may be instanced the Scotch Borderers, a body of men noted in the past for their physique, but who are now unquestionably deteriorating—a very considerable matter, one would say, but, according to the correspondent of a Scottish newspaper, attributable to so comparatively simple a cause as closed windows.

The wearing of warm dressing-gowns till the moment before an event is a wrinkle known to the American athletes, and worthy of imitation in England. Neither muscles nor nerves can put on their best working pace unless they are warm: the difference in nerve impulse so caused may amount to many feet per second. Galen, who was physician to the gladiators in his native city, says, "If any one immediately after undressing proceed to the more violent movements, before he has softened the whole body . . . he incurs the danger of breaking or straining some of the solid parts. . . . By moderate rubbing with a linen cloth warm the whole body beforehand." After this warming rubbing he counsels the slight unction of oil; but, apart from this latter recommendation, which does not apply to the same extent in our day, there seems little reason for the English athlete to lag behind America and Galen for knowledge.

Methods of Exercise

Of the potential energy absorbed by the body in the shape of air and food it has been indicated that there is a surplus corresponding to some three hundred foot-

tons which has to be disposed of in the form of external work. The daily actions performed by every one consume a surprisingly large portion of this in the case of even the most sedentary individuals, but if a rule must be made it is safe to say that at least two hours of each day should be spent in the open air.

Various objections, more or less quaint, have been urged against the value of walking when this has to be done in a city, and undoubtedly the country would be preferable, or, when this is unattainable, a park or gardens, avenues or, at the worst, streets blessed so far as possible with trees. Even in London it is possible to walk for miles without losing sight of trees or grass. But when the walk must perforce be a brick-and-mortar one there is little need to worry, for instance, because one's left foot is slightly higher than the right, or *vice versa*, on account of the necessities of modern street paving, since crossing a street is not an extremely difficult method of obtaining a change. It can hardly be claimed by even the most bigoted admirer of "Nature" that she has seen to it that our feet shall always be on the same level in mountain, valley, or even field. The jar of unyielding cobbles or asphalt is another matter, but if a man does not wear rubber heels on his boots he deserves all he gets in this respect. So far as the actual air of the town is concerned, he may breathe a considerably worse mixture by remaining in his bedroom. There are towns or parts of towns in the neighbourhood of chemical works where the air is actually unfit to breathe, as is evidenced by the death of all plant life in the vicinity, but these are the exception, and in the thick of a town like Manchester the carbonic acid is only present in the proportion of four parts per ten thousand, while six is the permissible limit. In particularly "smutty" localities it is only the more necessary to recollect that elementary rule of breathing which prescribes that this shall

be done through the nose, the mouth being kept well closed.

There is no excuse, therefore, for remaining indoors on the pretext that as little of the town air should be imbibed as possible. Bramall Lane, at Sheffield, is in the midst of soot and smoke, yet it is the headquarters of one of the most famous football teams in the kingdom, and I have had personal opportunities of judging that its members do not seem to suffer unduly in either physique or skill as compared with others more fortunately situated.

Even violent exercise, then, may be indulged in with impunity in the centre of a large town, and this is well, for, phrase it as one may, there is undoubtedly a somewhat depressing monotony in nothing but walking. It will not be disputed that games, in their beginnings at least, are as natural as walking, and it is from the point of antiquity of value to the economy that all games, sports, and pastimes must be approached. If any other method be attempted the result is only hopeless confusion, as is evidenced by such an authority indeed as Clifford Allbutt, who condemns any game in which there is no risk, on account of its lack of value to character, on which ground, therefore, he derides lawn tennis! I do not mean to attempt to decide the question of the best game for any given individual. What will be indicated is how various pastimes are in more or less conformity with the needs of the body, historical as well as present. There can be no such thing in our days as a definite simple life, an absolute rule of conduct, or a universally applicable pastime.

The young of man, like that of any other animal, is for only a very short time satisfied with the resources contained in straightforward progression, and this soon becomes complicated by the instincts which lead to play. At what stage precisely something round entered into

this play we cannot say, but from the natural occurrence of rounded stones and fruits and nuts it is justifiable to suppose that this must have been very early—probably, indeed, almost contemporaneous with playing itself, as any one would judge who has watched a kitten. Ball-games have, therefore, a foundation deep laid in our development, though from the simple tossing to and fro and the chase of elusive roundnesses there have evolved such complications as golf or modern football.

Ease in rolling first brought about the formation of a ball as a thing to be desired in imitation of those natural prototypes, and when there came to be understood the possibilities of the spin which might be imparted to it, the appeal of games with round things took a longer lease on the affections of mankind, a lease of which we are not yet in sight of the end. For it is not many years ago that a grave professor of physics in a northern university seriously deduced from the laws of natural science that the flight of a golf-ball could not exceed a certain distance, and it is just that time ago less only a few days that the son of the professor unfilially scoffed at science by driving further than the authorised distance.

We must recognise the antiquity of such natural playing, and its value still, as a means of development and exercise. The essence of these games consists in walking and running, combined with a training of the eye to estimate flight and distance, and of the body to adjust itself to rapidly demanded positions, evidently an admirable preparation for the sterner necessities of life, which depend in large measure upon the perfection of the movements made available by the playing. There is this lesson, at least, to be learnt from the play of animals, that it is in its every motion adapted to develop those acquirements of nerve and muscle upon which the life of the animal will have to depend.

Pure football is readily traceable from its beginning, and it still possesses enough of the primitive form for its value as an exercise to be evident; the difficulties that have been superimposed upon the free chasing of the ball to any point make the game, and are also obvious. The wish to increase the difficulties by alteration of the propelling power has led to polo, tennis, and golf, with croquet and their allies, whilst in polo extraneous obstacles in the position on horseback have been sought. The prescription of a definite time-limit, such as the ninety minutes of football, has made the game more valuable in inculcating endurance. From individual play to team play was a great advance in the direction of discipline, and so it has come to be that with the conscious or unconscious perception of interdependence between all men and all things the most valuable sports are not individual.

Any game or sport must be judged not from the extent to which it brings every muscle of the body into play, but from the manner and degree of its exercise of those muscular systems which our development teaches us are intended to work together. To deliberately practise one exercise which is best calculated to bring out the lumbrical muscles of the hand, for instance, is absurd, or to throw the chest into that position which will cause the *pectoralis minor* to bulge is equally absurd. Muscles are not meant to work or be developed individually: they form parts of definite muscular systems, and it is to the working of such systems that any sensible muscular training must direct itself. In going for a walk or a run a man does not separate out his *gastrocnemius*, or principal calf muscle, and interrogate it alone as to his condition; but this need not be pursued further—it is too ridiculous. The following the “run” of a muscle as shown by its fibres does not prove that that muscle should be worked in one special direction. Muscle can contract in mass or in parts, trans-

versely as well as longitudinally. Movements and the ease of them, study by all means. Leave particular muscles alone.

All those branches of athletics which exercise fully the lower limbs satisfy at once the first demand that has to be supplied—that the powers of locomotion must be considered. Thus all field events fulfil the first essential. Golf is probably the ideal form of a gentle exercise which, depending mainly upon walking, yet includes something of value to the training of arms, body, and eye. Cricket has its recommendations written large by reason of its appeal to the same factors. Skating is always excellent, as are hockey, football in reason, dancing, and many more. The advantages of swimming require no exposition; by it every group of muscles of the body which are at all useful in human life are fully exercised, but on this account of the completeness of the exercise it must be remembered that it is a severe test of condition and stamina. By reason, too, of the fact that it is conducted in water—which in our clime at least is always considerably below the temperature of the body—there is a greatly increased conduction of the body heat, and unless this is made good by the exertion there is evidently considerable risk of chill, or some other result of the diminution of resistance thus caused. Ten minutes in the water of the sea is sufficient for any one, no matter what the conditions, and the same statement will apply to the swimming that occurs in baths. In this connection it is decidedly desirable that there should be more stringent rules regarding the use of the plunge bath on the part of many who go swimming in towns. The water in many public baths is absolutely filthy, and scarcely suitable for benefiting the body.

In fact it will, perhaps, be simpler to give those exercises or sports which are not all-sufficient in themselves as providing a complete satisfaction for the bodily needs.

Prominent among those lacking in completeness is rowing, in its humbler forms where the slide is unknown, which considers the legs to the smallest possible extent, and cycling, which involves the lower limbs too exclusively. Jumping, hammer-throwing, and weight-lifting resemble the taking of food in tabloids—they are much too concentrated. The same, of course, may be said of the sprint in competitions and of many other events. It is a safe rule that abnormal efforts which leave the competitor helpless at the end of his event are foolish. The undergoing of such strain would only be justified by the necessity to preserve life itself.

Boxing, or rather sparring for the love of it, and step-dancing are the best indoor exercises, and there can be little question as to which of these is likely to be the most useful.

Singing is an excellent exercise for the lungs apart altogether from the value of the rhythm in its effects upon the mind. This is likely to be immediately recognised in the training of the British Army, which Surgeon-General Evatt is endeavouring to lead after the example of Japan, where the value of singing to the fighting man is thoroughly realised.

Women are not intended to excel in any game requiring either strength or speed. As tennis players the best of them are not more than half as good as the best men, and as runners their build, if they are built as women are intended to be, is against them. There are women who have run to hounds on foot season after season and also reared a family, but this as a fact is curious. The games of women should be with other women, just as growing lads should not be pitted against men. In this matter, though on no other, we are strongly of the famous opinion expressed by Dr. Johnson concerning the sex in another matter.

Gymnastics and any other form of physical culture that has to be taken indoors should only be resorted to when it is impossible to have outdoor exercise. But gymnastics, since it concerns itself with teaching or helping the body to perform definite movements, is far ahead of the systems which treat individual muscles by causing them to undergo aimless movements. Dumb-bells and Indian clubs have their uses, but are lifeless and mechanical as compared with games, and the actions are too likely to become more or less automatic. Rubbers and other appliances are ingenious as trying to make the unprofitable seem diverting, and it is just possible that a number of people who would not walk a mile may by means of such trickery be induced to take a superficial cognisance of their muscular system, but England will be in a bad way if she has ever to depend upon a nation of bedroom athletes. Germans are bad marchers, though their gymnasias are something in advance of muscle-at-home systems ; but what can be expected of the walking powers developed by these latter ?

Attention has all this time been directed to merely the muscular part of the benefits derived, but it is necessary to point out that the circulation and respiration are the other functions most immediately stimulated, and through these the whole organism is invigorated. The contraction of any muscle means a more rapid oxidation of its products and a call for more blood, which through the cry of its nerves is at once supplied, meaning of course that the whole blood must circulate more rapidly. This connotes an increased demand for oxygen and as naturally an increased intake of air. A brisk walk implies the consumption of four times the oxygen required during rest. If the respirations are to be more rapid naturally nothing must be allowed to interfere with them, so that along with exercise must always go a freely acting heart and lungs.

When the heart cannot keep pace with the demanded speed of circulation "stitch" ensues, and the getting one's "second wind" means that the heart has succeeded in accommodating itself to the strain. Too great a "stitch," resulting in absolute breathlessness, is a warning that must not be disregarded. Evidently, with this need of rapid blood supply, exercise should not be taken when any part of the body is in special need of a large portion of it, which suggests that immediately after a meal is the worst time possible. Before breakfast only that amount of exercise necessary to expand the lungs fully and to clear the remnants of the sluggish night air from its inmost recesses is desirable—a few minutes' yawning or stretching does for most people, or simply swinging the arms alone or with two-pound dumb-bells. In the majority, the time spent in the morning tub and rub down, shaving, &c., with ten minutes in the air before breakfast, will suffice for all such needs.

Summary

The full use of the limbs and every part of the body has to be ensured to the infant by the looseness of its clothes. As soon as the child is able to crawl it should be encouraged to do so, and when from this it is able to advance to walking and running no obstacle is to be placed in the way of these movements. Till the age of seven, deliberate education ought not to be entered upon; parents ought between them to be able to afford the time necessary for guiding their children, amusing and exercising them. From the beginning of school age till the age of puberty no differentiation of treatment of any kind whatever is necessary as regards the sexes.

School-work (preferably only extending to four hours at most a day) can with advantage be intermitted altogether for some time while the body is becoming moulded to its new possibilities at puberty; and exercise at this time

EXERCISE, TRAINING, AND ATHLETICS 83

above all must not lead to harmful fatigue. No competitions, either mental or physical, should be permitted at this period.

Training is a matter of lifelong importance, and ought never to be a special course entered upon for a short interval with one definite competition in view. Life training consists in observing the proper rules of diet, exercise, habits, and sleep. The individual pre-eminence aimed at by the common system of training is good for neither the sport concerned, the individual competing, nor the race as a whole—it tends inevitably to the formation of a professional class who are specialists in departments which should be eagerly entered by the whole youth of the nation, and though it raises the standard among the specialists it tends to convert the others into spectators. We have the historical evidence of Greece, the rise of the athletes with a corresponding degradation or deterioration of the rest of the Greeks, in proof of this. The people of which every member is a capable, able-bodied citizen is much more likely to maintain national greatness than that nation amongst whom under modern conditions are to be found the greatest number of record-holders.

The foundation of all muscular exercise must be walking, and those games are best in which this and running take part to the largest extent. But along with participation of the lower limbs must always be considered the freedom of the circulation and respiration.

Exercise ought to be taken always in the open air, and where this is not possible the nearest approach to it must be obtained by open windows ; further, daylight is the best time for any exercise—there is a stimulation in light rays which is not obtained from our various faulty and trying methods of artificial lighting.

Boxing and dancing or jujitsu are the best of indoor exercises ; gymnastics are of distinct value ; club-swinging

is of more value than dumb-bells on account of the greater variety, rhythm, and interest of its movements, but neither of them alone is of great importance for other than arm and chest muscles. As for the various systems of indoor physical training, they are all deficient, as they ignore walking and the other co-ordinations of muscles that are in the daily use of the body, while they supplant these by totally unnecessary refinements. Such systems as the latter are condemned because they substitute size for value, indoors for outdoors, and ignore walking. They are of no advantage, but rather the reverse, in the case of those whom they tempt from outdoor possibilities ; their value consists alone in enticing some, who would otherwise neglect their bodies, to a most erroneous but still not wholly worthless appreciation of its importance.

No violent exercises should be indulged in by women, and they should match with their peers—otherwise an undoubtedly beneficial pastime is likely to become a stimulus to a harmful competition in directions in which not man, but nature, has forbidden them to excel. Exercise, however, is as essential to woman as man. But women ought to learn that the differences in their bony structure—differences which can undoubtedly be harmfully nullified by certain sports from childhood—are yet present with a purpose to which it is necessary to attend. The shape of the pelvis, too, is only one among a multitude of counselors that protests against the athletic woman. There is nothing in all of these considerations, however, to militate against a healthy physique.

Violent exercise before breakfast is a mistake, though it can do no harm to spend some half-hour or so over the matters of the toilet as previously suggested. The time for muscular exertion—I speak of course to those not engaged in manual labour—is two and a half hours after a good meal and in daylight : two hours at least ought

EXERCISE, TRAINING, AND ATHLETICS 85

to be spent in the open air, and one hour's continuous walking or its equivalent will be needed for a satisfactory day.

Middle-aged and older people must guide their extremes in exercise by the state of their heart and the condition of their arteries ; they need be limited only by the precautions necessitated by these.

CHAPTER V

FATIGUE AND MASSAGE

Death due to the cumulative action of fatigue products—Blood of tired animals is poisonous—A man is as old as his arteries—Fatigue, strain, and alcohol—Atrophy—Fatigue can never be eliminated—Essential to consciousness—The absence of fatigue in movements is accompanied by a loss in attention—Life must always be difficult to the thinker—Seat of fatigue is the brain—Folly of change of occupation as a cure of actual fatigue—Rest—How emotion overcomes fatigue—Sleep—Coffee, tea, cocoa, alcohol—Neurasthenia and insanity the penalty of too great an ignoring of fatigue.

Massage.—Homer and Herodotus—Imitates the squeezing action of muscles—Anatripsis—Gentle rubbing stimulates growth—Vigorous rubbing—Beauty-doctors—Massage left to the unqualified too much, hence disrepute—Testimony to value from Plato, Hippocrates, Pliny, &c.—“Lomi-Lomi”—Suggestion to Channel swimmers—Procedure—Flicking and slapping to rehabilitate the devitalised—Value to boxers and the fatigued.

METCHNIKOFF has declared that the span of that life which is not determined by definite disease or accident should extend over a period of one hundred and forty years; and this statement he buttresses by data derived from physiology, pathology, and his own researches, as well as by less justifiable deductions from Biblical records.

The opinion appears to be gaining credence that natural death should occur as the result of changes induced by the imperceptible effects of gradually cumulative fatigue, and that therefore the rational method of endeavouring to secure the longest and healthiest life is to prevent the

harmful effects of such fatigue products. It has been noticed that the macrophages—one division of the body-scavenging cells—are assisted in their destructive work on the functioning tissues of any organ or part by the acid materials formed during over-activity of muscles or brain. The blood of a dead-tired animal is actually poisonous to another of the same species, whereas the blood of the untired can be injected without harm. Experiments proving this convincingly were made by Dr. Weichardt upon guinea-pigs, run until they were tired on miniature treadmills.

In the deterioration of body tissues caused by the gradual action of fatigue or by poisonous material, such as alcohol, is to be sought the explanation of the progressive thickening of arteries, and the meaning of the famous dictum of Cazalis that "a man is as old as his arteries." The importance of the condition of the blood-vessels would be hard to exaggerate, so it will suffice if we take them as the type of the body. Largely owing to their state it was that Greece declared the age of possible improvement in athletics to cease at thirty-five, and they too were responsible for the age limit set by Rome for active service at forty-five. Needless to say, however, the physiological secret for their empirical wisdom was not known by the people of those times.

There is, however, another factor in the production of devitalised arteries in the shape of strain, meaning the effect of mechanical pressures and agencies, as for instance the increased rate and impact of the blood stream in the aorta when the heart is labouring excessively, one result of such strain in the region mentioned being well known as aneurism.

A third means of causing deterioration of any part will occur to every one, viz., that lack of functioning or vital activity which, by failing to secure the necessary circula-

tion, will in this way tend to cause an accumulation of effete products and that special kind of deterioration known as the atrophy of disuse.

The antagonism or prevention of strain and the prompt removal of such material as the acid-phosphates when these are formed by the activity of the body is the basis of the prevention of fatigue, and the physiological guide to the prolongation of life. Such knowledge is far from that of an elixir of life, and indeed it is hardly to be expected that while there is resistance to the passage of any movement or impulse among material particles any such absolute elixir can be discovered or suggested.

It may be suggested on the analogy of the lower reflex mechanisms of the human body, the most noticeable feature of which is the apparent absence of fatigue, that the higher mechanisms might also be trained to attain the same desirable immunity. When, however, by means of "habit" we succeed in imitating the automatic movements, we find that something has been lost, that with the ease has passed away thought or consciousness, and we are indeed led at last to see that this resistance *is* consciousness; while on the intermediate levels of nerve centres a similar lack of resistance connotes absence of sensation. The psychological proof of this statement cannot here be given; it may be found in the treatises dealing with the subject. But it is forced upon us that without resistance there can be neither sensation nor thought, and this is the answer to the desire to eradicate fatigue. Life, therefore, must always be difficult to the man who thinks—otherwise he could not think; the "strait" path of the Scriptures is therefore justified.

No human being can actually so tire his muscles that a stimulus reaching them will not cause a responsive contraction; and no more can he tire his nerves. The essential of fatigue is the action upon cells of the brain

of certain acids and acid salts formed during the conversion of the potential energy of the tissues into the kinetic form, an acidity which is normally removed as fast as possible from the body in the urine. By the circulation of the lymph and blood these substances are removed from the points of their manufacture into the general circulation till a point of saturation, so to speak, for the brain cells is reached, and that is when the brain says "No." Consider now the folly of that theory which prescribes change of occupation for the removal of an existent fatigue—that, in fact, by addition you can cause subtraction. For the ready energising of brain and all body cells, they must be surrounded by alkaline fluids. Could weak alkaline fluids be injected to reach the protesting cells then fatigue would vanish ; but nature's way is a method of gradual elimination, and for it rest is necessary. If by any sudden excitement the circulation of the blood is hastened, there is the same effect by a more active removal in quickly dispelling the acidity, as if the alkalinity had been added. Thus a burst of anger, joy, or other profound emotion is well known to overcome the most deep-seated fatigue.

The paralysing acidity is naturally removed by rest or sleep, and because natural, this is probably the best method. There are many stimulant and other devices by the utilisation of which fatigue may be ignored for a greater or lesser period, but they only postpone the final reckoning. Without considering the action of ostensible drugs, we may note that there are articles in daily use whose chief aim is the delaying of fatigue, but of them all there is only one group which directly stimulates the cerebral cells. Coffee, in the highest degree, by virtue of its content of caffeine, and tea and cocoa to a lesser extent have this cerebral action. Since none of these substances is a food, it is very evident that they supply only a goad, and that

too prolonged indulgence in any of them will result in disaster. These articles of diet—drugs they undoubtedly are—are not to be used unguardedly more than any other drug. Alcohol comes into a different category, but demands even greater precaution in its use. This point need not be laboured; alcohol as an aid to training has had its day, and as an article of diet it has been sufficiently condemned. The danger which lies hid in such means of obscuring the fatigue of nerve cells lies in the difficulty of their recovery from excessive strain. In the natural process the brain cells are the first to warn us when we have done enough. If by our stimulants we cover such warnings it is evident that a worse thing will happen, and this happening is already perceptible in the extraordinary prevalence of neurasthenia, to say nothing of more irreparable brain damage as is witnessed in every lunatic asylum.

Here it is necessary to interpolate the remark that while each individual by training may temper his body to withstand the maximum of fatigue permissible to it, it must be remembered that this training, affecting as it does the ultimate constitution of his protoplasm, cannot possibly make a Dinnie or a Webb of the ordinary citizen. It was Professor Rutherford who first sonorously enunciated the truth that there is a difference in the stability of the individual protoplasm, and that the personal equation—to phrase it differently—can never be ignored. Environment (in its scientific sense) can do much, but as it is not possible for us even to provide two exactly similar environments, no absolute level of humanity in muscle or mind is attainable, while in addition there is the complication of different heredities.

With this warning against the attempt at impossibilities, such as the making of a "strong man" from an average

physique, we may pass to discuss an undeniably physiological device for eliminating the effects of exertion, a device which is but little recognised as of value to the healthy, and which has been chiefly relegated to the treatment of actual pathological conditions, but which is deserving of a much wider field as an agent of prevention. Hippocrates writes of rubbing or massage: "Rubbing can bind a joint that is too loose, and loosen a joint that is too rigid. It can make flesh and cause parts to waste; moderate rubbing makes them grow."

This rubbing appears to be fully as old as surgery or medicine itself, as may be imagined when it is recollected that there is an instinct which prompts us to rub a cramped leg. Homer speaks of rubbing and anointing. We may note for the edification of a certain notorious physical culture advertiser that the very master of Hippocrates, Herodicus himself, proposed gymnastics for the cure of disease, and considered these and the accompaniments of rubbing, &c., to be the chief agent in his living one hundred years. There may be little satisfaction in hearing that this rival system dates from some twenty-four hundred years ago.

It has been said that by stimulating the circulation waste products are naturally more quickly removed from the point of their origin, from the brain which registers their presence, and from the body generally. To quicken the heart by the direct action upon it of drugs of course suggests itself, but if the waste products are sent more rapidly into the blood stream and this stream itself quickened, the same end will be achieved, and that is what massage not only professes but does. Our civilisation has allowed this matter to fall into the hands of quacks and frauds till recently, but every Englishman believes in its benefits who also believes in the virtues for himself or his horse of "a good rub-down." Among

certain savage peoples it is a ceremonial and the highest gift of hospitality, and travellers tell us of its wonderful soothing and stimulating effects.

This fact should be realised, that the play of the muscles in their pulling and dragging upon tendons, fasciæ and aponeuroses—names which the reader must take for granted—as well as by their own contraction and squeezing, promotes the flow, sluggish at best, of the lymph which bathes the cells of the body. This lymph contains all the excretions of such cells as well as their nutriment, so that the need of its being moved on regularly is very evident. There is thus some truth in the suggestion contained when we speak of those who do not care for exercise as being of a “lymphatic temperament.” In the removing of depressing excretions also lies the secret of that real joy of life which ordinarily can only be obtained by bodily exercise.

Massage takes the place of the voluntary muscle movements in promoting the lymph and venous flow to the heart, if the rational direction, that of anatripsis or rubbing “up,” be followed. It is clear that rubbing a leg downwards towards the toes will actually retard those processes it is meant to facilitate. There is an idea that massage is extremely laborious work, and it has indeed been recommended that the physician who undertakes it should drink a glass of good old wine every fifteen minutes, which would seem to give an imprimatur to this suggestion of its comparability with navvying; but though massage is no sinecure, as those who have tried or witnessed its performance are well aware, it is a matter of skill as much as of endurance.

Into all the sub-divisions—*pétrissage*, *éffleurage*, *tapotement*, and so on—I do not intend to go. Our purpose is to realise how it may do good to the normal body. This may be admitted at once, that gentle rubbing of any part

of the body stimulates growth, which is a fact known and utilised by those beauty doctors who secure the success of their own face foods by rubbing them in, while it is equally true that vigorous rubbing will remove superfluous fat—a part of the truth known to those who treat obesity successfully, with no matter what preparations, by vigorous friction. The function of this latter is sometimes imitated by those tightly drawn straps and belts which claim to “melt the flesh away.” Any surgeon will tell you that intermittent pressure tends to cause overgrowth, whereas a constant pressure will produce ulceration or disappearance of tissue. Of the first fact corns are our universal witnesses, while of the last bedsores are convincing proof. The skill of the beauty doctors lies in applying to their art the knowledge with which a trusting profession too confidently furnishes them.

For the absolutely healthy it may be stated that though massage is not essential, yet, like bathing, it can be utilised as an admirable and pleasant promoter and supporter of health. It is not, however, a matter of simply rubbing anyhow so long as the direction, towards the heart, is right. It necessitates a considerable amount of manipulative skill, which can only be acquired by careful teaching and equally careful practice. In this country we are still content to leave the virtues of an admirable treatment in the hands of bonesetters and the unqualified, but on the Continent, and especially in France, they have long had an appreciation of its importance, and do not think it beneath the dignity of the physician himself. Germany was slower than France, but at the University of Berlin there is a “Professor of Massage.” In the long roll of those of more ancient days who tested this question and found the virtues of massage there is not the least weight of authority.

Take the names of those who perceived its benefits in

the chronological order in which they will occur in any textbook of the history of the subject.¹ Plato objected to it for protracting unnecessary existences. Hippocrates said the physician must be skilled in rubbing. Cicero attributed his later better health to his anointer. The Emperor Hadrian gave two slaves to an old veteran whom he found rubbing himself against a marble pillar, in order that they might do his rubbing for him. Pliny tried to get the freedom of Rome for his physician, who had rubbed him into health. Galen's advice to athletes has already been noted. Paracelsus praises friction. Ambroise Paré describes how it should be used, while Sydenham, Ling of Sweden, and Balfour bring the chorus of praise up to comparatively modern times. It is hardly to be doubted that there is something of value in a process which withstood the critical examination of such men for over two thousand years, but there is more than the evidence of history to fall back upon.

The Hawaiians have a procedure named by them "Lomi-Lomi," which is essentially massage, and by means of which, even when in the water on a lengthy swim, they are able to reinvigorate an exhausted swimmer so that he is able to proceed. Would-be cross-Channel aspirants might do well to note this fact. It is extremely interesting to observe in Dr. Emerson's remarks on this subject made in 1870 that to this treatment—which is, of course, extended to them whenever they will it—is probably partly to be ascribed the superior stature and physique of the Sandwich Island chiefs, which is twenty-five per cent. better than that of their subjects who belong to the same race.

Fundamentally, massage depends upon the virtue inherent in that hoary adage that "nature abhors a vacuum." Most of us have a rather prominent vein which

¹ See "A Treatise on Massage," by Douglas Graham, M.D.

runs up from the inner side of the ankle along the leg to be lost from sight in the thigh. Squeeze along that vein towards the heart and it will evidently empty itself; the vacuum thus created when the pressure is removed cannot be filled from above, on account of valves in the vein, and it has therefore to be replenished from below, which means that the venous circulation has been stimulated. It is not possible, however, to perform such a movement without in a precisely similar fashion affecting a number of lymphatic vessels, so that this circulation also is encouraged at the same time, and as the lymph is the fluid most intimately surrounding the ultimate cells, these cells will be acted upon, and in the way of a more vigorous life, since the stagnant material loaded with their excretions is the first to depart.

That, then, is what is achieved by simple, gentle stroking, and the next process is naturally directed to reaching the deeper tissues, once having cleared a path for superficial material. Deep kneading undertakes the second necessity, and it is in this that the skill particularly is required, for, while some force has to be used, bruising is most particularly to be avoided. As a result of such kneading, muscles are toned and nerves soothed, so that while the total effect is one of sedation, there is afterwards the ability to undertake muscular work should this be needed, no matter what the previous fatigue. The flicking, slapping, or tappings that sometimes finish the process have also their stimulant effect upon skin and circulation. It may be noted that such flickings—birchings indeed—were at one time a jealously guarded secret for the rehabilitation of those devitalised by excess. Ovid has something to say on a somewhat similar point.

By promoting the circulation of those who are somewhat deficient in this respect massage is an invaluable beautifier, while for all weariness and many of the simpler aches

and pains there is nothing more efficacious. In the cases where violent exercise is to be undertaken it is an excellent preparative. During the intervals of a contest, as for example boxing, nothing can take its place as a revivifier, and the same may be said where it is required to recover quickly from the bruising, fatigue, and depression consequent upon prolonged strain of either body or spirit. To those who may doubt my own I have quoted sufficient authority.

CHAPTER VI

CLOTHING

98.4° Fahrenheit the key to the situation—Clothing is not essential—Science shows that it is economical—Cleanliness—The meaning of “warm”—Air as a “warm” layer—Materials of clothes are of secondary importance to their manner of containing air—Absorption and warmth—Flannel a heroic measure—The interdependence of food and clothing.

Clothing of Infants.—Ridiculous swathings—Older children—Bare knee absurdity—The susceptibility of joints—The kilt investigated.

Girls' Clothing.—Good points—“Hardening”—The experiment of the “Sun Brothers”—How originally excellent garb is stultified in older girls and women—Abdominal support of skirts—Proper position of belt.

Men's Clothing.—Hats—Panama eulogised—Women's better—No hat needed—Caps dirty but comfortable—Male garments—The absurdity of waistcoats—Trousers—The polishing of boots—The brushing of clothes.

Underclothes.—Pockets are dirty things—The white shirt—Objection to detachable cuffs and collar.

Evening Dress.—Collars—Garters—Braces.

Women's Garb.—Must follow principles stated under men's—Short skirt—Corsets, &c.—Athletic garb.

The danger of durable clothes—One suit a week the ideal—Cheap clothing commendable.

IT is fortunate that in this book we are limited to the consideration of clothing as it affects two important principles in the hygiene of the body, as otherwise the exuberant fertility of the theme could hardly be restricted within the pages of one such volume. That there is a philosophy of clothes Carlyle has already taught us: that there is a poetry is evidenced by some of the most notable lines in our literature as well as in the almost unnoticed

metaphor of daily speech: that there is a sociological aspect of the question is readily demonstrable; but most important of all, though possibly the least welcome, there is also a science of clothing. As scientists we are not interested with such subsidiary matters as the disreputability or the contrary of the human skin, nor with the extent to which its coverings may subserve the primary sexual instinct of ornamentation, except in so far as the attainment of any such issues will affect the purpose towards which this investigation is directed. Our primary concern is with neither the decent nor the beautiful, but with the extent to which clothing may be useful to man as a means of securing warmth or protection, without any, even the slightest, negation of cleanliness.

The key to all health—so naturally the key which will best open the way to the discussion of clothes—lies in the simple statement that the body, and every part of the body, must be permitted to do the work for which it has been designed, and that its temperature in so working is to be maintained at some 98° Fahr. This truth is most tersely expressed in the dictum that “Man is homoiothermal.” 98·4° is the optimum temperature for the average healthy individual, and it will not need to be emphasised that the functioning of all parts of the body is essential to “complete living” or scientific health.

From the case of such tribes as inhabit, for instance, Tierra del Fuego, we realise that clothing is not essential for even purposes of warmth, and that the skin can become habituated to the greatest rigours of cold, while in Central Africa, &c., we are led to perceive that they may be dispensed with as a protective against heat. With temperatures above 98°, however, England has no practical concern, and it is one more exemplification of the maxim that “science follows art with limping pace” which enables us to justify on physiological grounds the universal custom

in our own country of wearing clothes as an assistance in protecting the body from cold. Without such clothing, as was the custom with our woad-painted ancestors, life in these latitudes is quite possible; but, late though our science be in following practice, it at least prevents us from reverting to the nakedness of the past—on grounds of economy. It is unquestionably cheaper to wear clothes and so prevent the undue dissipation of animal heat than to provide for such dissipation from the unprotected skin by a greatly increased food-supply. The first value of clothes, then, is in the sparing of fuel. Bodily heat is of course derived from bodily energising; in the maintenance of that at the desired constant level the skin takes by far the most important part, and since it is with the skin that clothing is most directly concerned, the second essential feature that must characterise healthy coverings becomes clear; in addition to warmth they must maintain intact the skin functions, and, as soon becomes evident, this important necessity will be more or less completely fulfilled as the clothes permit of cleanliness.

It will be simplest to define generally the qualities that should distinguish rational clothing, and then, with these main principles accepted, to test by them the ordinary garb of modern life as illustrated in the usual complication of articles assumed by us all.

With the idea steadily in view that we are discussing a means of economising the resources of the human organism, it will at once be decided that as little weight as is possible is to be added to the body, and investigation therefore must first of all be directed to those materials which possess most warmth for a given weight. It is at once necessary to point out that nothing is of itself "warm" if we note the obvious exception of radium; and on a more careful examination of our terms it is soon found that what is required is the lightest possible substance which is at the

same time a bad conductor of heat. The lightest of all comparatively non-conducting materials is air, a fact which is utilised by Nature in her fabrication of those marvellously warm textiles, wool, fur, and feathers—for these in the last analysis are interrupted layers, closer or open dependent upon their special province, of air. From this non-conduction, too, arises the frequently observed fact that tight clothing is less warm than loose, weight for weight. There must, of course, be restrictions to such looseness of fit, as is clear from a short study of female apparel, which, to attain the same comfort of temperature, requires according to one estimate some 40 per cent. greater weight than that of a man. The actual substances used to form the strata and cellular air spaces seem to be of comparatively slight importance; what is required is that air should be present in the form which least permits of convection while its non-conduction is preserved at the maximum.

The wearing of clothes in layers—which for convenience may be described as inner and outer—has arisen from the impossibility of obtaining in the one material the dual possibilities of warmth and cleanliness or skin protection. Naturally the warm is the external of the two. Least interference with the functions of the skin is obtained by the clothes touching it being highly absorptive, a quality very evidently required when it is recollected that some fifty ounces of water from the sweat glands alone are evaporated by the average adult daily, while in addition there is a continuous though slight exhalation of other gases—two litres a day of carbonic acid, for example—along with some solid constituents in the sweat, and a comparatively large amount of sebum or oil from sebaceous glands. The ease with which the tiny sweat orifices may be choked is illustrated by their size, since, minute as they are, they represent—over the whole surface—an area of over ten thousand square feet, or six times the

area of the flattened-out lung vesicles. Absorption power, too, is dependent least upon the material used, but chiefly upon its texture; hence it arises that the wearing of flannel next the skin is nowadays a heroic measure, since there are so many much more comfortable and suitable fabrics made from wool, cotton, linen, or even silk, all of which satisfy more completely that necessity in which it was supposed flannel held a pre-eminence. Nor indeed has it ever been the case that all flannel was absorbent, of which there is striking proof in the article, elsewhere more vigorously condemned, known as a "chest-protector."

Having now defined the functions of clothes, and differentiated between the primary two layers of these, it remains for each individual to apply the necessary tests to his own raiment, with the recollection also that, if it be granted that there are differences in individuals, there should also be differences in the amount and absorptive and non-conducting qualities of their clothes. Application of this last statement should lead to a cessation of the silly notion that summer clothes should be donned at such a date and winter garb adopted on such another. Also it should help to eliminate the presumption that two changes are sufficient to mark the caprices of the weather in each year. As rational beings let us ring the changes on our clothes daily if it seems fit to us so to do. If, deliberately, we wish to exercise our skins by making them respond to changes of temperature, that of course is an excellent reason for wearing the same amount on a cold as on a warm day: it must be noted, however, that more food will be required to meet the necessities of cold in that case. But if along with the same clothes and the same exercise, the same amount of food is consumed, then we are behaving simply foolishly.

Food and clothing are matters so correlated in the share

which they take in maintaining the body heat that a word regarding the former is permissible. Appetite, as we have come to understand it, is an extremely fallacious entity, and nowadays is rather due to the formation of a habit by the stomach than to the natural expression of an actual hunger. The three-meals-a-day cult has absolutely smothered the original useful instinct, with the result that in summer we endeavour to maintain the practice of winter. The result is a perpetual condition in warm weather which might very well be termed "hyperpyræmia," or more colloquially "overstoking." Such hyperpyræmia is quite incompatible with the lessened production of heat that ought to occur when the weather is warm, and, as is quite comprehensible, there will be a proportionate difficulty, when clothes are worn at all, in securing a comfortable degree of coolness. It may be commended, therefore, to those who suffer from threatened heat apoplexy, that they should look into this matter of the relation of diet and clothing to bodily temperature and coolness, and if there is no fault to be found with their system of clothing, possibly there is explanation of the discomfort in their treatment of the other factor.

In the long-clothes period of infancy the peculiarity of the garb is enforced by habits, or rather lack of habits, to which no more particular reference need be made, but emphatic protest must be made against the innumerable ridiculous swathings to which many of these small persons are still mistakenly subjected. Their clothes, even more than those at any other age, must above all be loose and permissive of freedom of movement, and this, it requires to be definitely stated, of not only the limbs but of thorax and abdomen. Tight clothes at this age affect growth as well as activity, and when this point is well assimilated, no more need be said.

Clothes

The clothing of his few-days-old infant is really a thing that should be investigated by the father, since, after thousands of years of motherhood and feminine inventiveness, the unfortunate child is almost as poorly catered for in this respect as ever. Next the skin of the trunk, but covering it for only a few inches, is usually placed a tiny chilly cotton or cambric garment somewhat resembling a chemise ; its material and texture will indicate the extent of its value to the child for either absorption or warmth. Encircling the abdomen is wrapped round after round of an interminable binder, also non-absorbent : it is absolutely no exaggeration to say that the average man, when he first sees this binder applied, will turn giddy in sympathy with the infant as it is revolved and revolved and revolved in conformity with the needs of this appalling garment. The excuse for it is the prevention of umbilical rupture, and in a straining, struggling, crying child some support is needed ; two folds of a more suitable substance would, however, be ample. Outside these articles are layer after layer of clothing equally ridiculous and equally disconcerting to the child who has to don them. In the result the arms are left practically unprotected, the thorax and abdomen are defrauded of possibility of expansion, and, finally, yards of dragging, clinging long-clothes are superadded to check to the greatest possible extent the incipient development of the legs. What the child needs is a soft, flexible, absorbent covering from neck to heels, including the arms down to the hands, and made to fasten efficiently and completely down the back of trunk and limbs ; outside this and also embracing the whole body a thoroughly substantial non-conducting substance also fastening at the back ; and for purposes of adornment any third superficial addition that may be suggested, always

providing that the looseness of the other clothes is not infringed on.

Clothes of children slightly older, while they cannot entirely ignore the lack of formation of fixed habits, have yet to be planned on account of that uncleanness which delights in "mud-pies" and similar delights, and the outer layers will require to be of considerable resisting power. The passage from the petticoated to the trousered stage in boys is guided apparently by custom or fashion, and there is frequently a tendency to perpetuate the former to some extent by the maintenance of a definite hiatus between the clothing of lower limbs and that of the feet and ankles. Now, however "sweet" the combination of short socks, bare brown knees, and dark knickers may be, it is entirely unphysiological. If the feet and ankles require covering, so most emphatically does the knee. It may be repeated here that joints are places of little metabolism; they take little part in the processes which originate body energising and heat, and are consequently dependent for their supply on sources in their neighbourhood. They are, in fact, points of assailability by cold, and require all the more to be protected from this; and such protection is scarcely afforded by the short sock fashion. It may not be irrelevant to refer here to a common affliction of growing boys which has in the past been comfortably referred to as "growing pains." These pains are, however, unquestionably rheumatic, and rheumatism is not necessarily a growth of a day.

The cult of the kilt for children, as well as for men, is based upon a misapprehension of its advantages; its disadvantages are obvious. The kilt is valuable on account of the thickness and warmth of the material which thus surrounds the whole lower part of the body as well as the hips and thighs. Where it fits closely to the body and upper part of the lower limbs it can in no way differ from trousers

if these are made of the same cloth in a similar thickness and warmth of arrangement. Lower than this region there is nothing to be said for it as compared with warm bifurcated garments, since the difference in freedom of movement is infinitesimal for properly-made clothes. The formula which requires that the kilt and bare knees be complementary is sufficient to condemn a garb whose recommendation, apart from the points considered, depends upon little else than tradition and antiquity ; with long stockings it would certainly do no harm. Most emphatically, however, in default of jacket and trousers which have homologated the valuable features of the upper part of the kilt, it is better to use this latter *in toto* than to neglect any child to the extent of putting it into the paperlike thickness of many " sailor " or other juvenile suits. The special parts of the body which require the careful shielding of efficient clothing are the apices of the lungs, the region of the kidneys and the loins generally, and all joints. This statement applies to all sections of humanity, young or old ; and if to the foregoing you choose to add the " lungs " in mass, then it will be well to recollect that the greater portion of these lies to the back, and that when a small square of wool or flannel is placed over the front of the chest it is the breastbone and heart that are being cared for.

In girls, at the age which corresponds to the trouser stage of boys, there is usually less reason to complain of their clothing, since this is quite comparable from the waist downwards in its various plies of petticoats, with the kilt. There is no reason to kill once more the deplorable fallacy of that " hardening " of children to cold, which distinguished a more Spartan and decidedly more foolish generation than our own. The need of children for warmer clothing than that of their parents is evident from their greater proportionate superficial area, their need of

all reserve energy to go towards growth, and the greater susceptibility of all incompletely developed life.

If any should be tempted towards that reversion to the "simple life" which is exemplified by the disregarding of clothes, there is material that may be commended to their consideration in the recent experiment of the "Sun Brothers," who formed a colony in one of the islands of the Bismarck Archipelago. Their costume was that of Adam; their food, nuts and fruits; and their work tilling the soil and tending herds. Two of their number died from the combination of exposure with an inadequate diet.

In more than one respect her older sisters might learn a useful lesson from the clothing of early girlhood. The boots at this age are adapted, so far as possible, to the shape of the feet and comfort, and the weight of skirts, petticoats, &c., is not dependent from the waist—which, it should particularly be noted, means the abdomen—but, by its attachments to the clothing of the upper part of the body, is suspended—as it ought to be—from the shoulders. So suitable, as a rule, is the clothing of girls of the better classes as compared with that of boys of the same age that there are writers to credit this with the better physique possessed by such girls, and it is after all by no means a preposterous conclusion, if the ill effects of exposure upon the growing organism be considered. When to the short skirts, shoulder-supported, of the girl, is added an additional foot in length of material, and the total weight of such material transferred from the shoulders to a band compressing and menacing the abdomen, it is easy to perceive the harm that is done by a perverse adaptation of an originally excellent method of clothing. This, then, explains why a garb is to the benefit of the sex which wears it in its early stages, and why to the un-initiated the same method of clothing may be so much

inferior and even harmful when worn by the same sex at a riper age. So convinced are medical men generally of the harm that results from any pressure round the abdomen that Dr. Cantlie—to mention only one instance—condemns unsparingly on this score even the belt worn by men at cricket, &c., if this is girt above the crest of the haunch bones, and not just below it. The refutation which has been suggested of this objection to such athletic belts is that these are not definitely intended for tightness but only to maintain the shape of the upper part of the trousers as these are cut in above the waist; the shape of the trousers alone is sufficient to keep them approximately in position, but for stooping just that little more is needed which the belt can supply. But whoever has worn a belt, and done exercise of any kind in it, knows very well that it has frequently to sustain a considerable pressure if it is in the decried position. The harm to women caused by the too firm pressure of waistbands is evidenced, if not in the actual practice of the gynæcological surgeon, at least in many of the disabling minor pelvic inflammations.

Among adults the average man's clothing is preferable in every way and for every reason to that of the average woman. It is lighter, warmer, more suitable to every variety of movement, more sanitary, better adapted to the protection of all susceptible parts, and even if the weights in each case were the same, is carried with a less expenditure of energy, and with a minimum of harm caused by either weight or tightness. So sweeping an assertion cannot be adequately supported by a further series of general statements, but the grounds for making them will be convincingly displayed in the more particular discussion of individual garments. The monotony of scientific opinion may be interrupted to instance a confirmation of its teachings from so unexpected a quarter as Cambodia. It is not ascertainable that the king of this interesting

country ever received a lesson in physiology, yet his reported statement on women's clothes as worn in Europe could hardly be bettered by a medical education. "European women wear far too many clothes. They should wear no more than two garments, one fitting close to the skin, the other covering the first. Besides they harness themselves too tight . . . at least their legs should be free." Examples of a rational feminine garb his Majesty was able to illustrate vividly by the production of his own dancing girls. The markedness of the agreement between Eastern common-sense and Western science rather stultifies Kipling with his "East is East, and West is West, and never the twain shall meet."

The detailed discussion of special articles of attire would be made undoubtedly much easier if our clothes makers had their way, for it will hardly be denied that next to death the tailor is the great leveller. It was one of Disraeli's tailors who insisted that his client should make up his mind as to his future in order that he might be fittingly dressed for it. Such discussion would be still further simplified if the scientific or Cambodian two-layered system ever obtained universal recognition. With hope for the future, then, but with an irrepressible sigh for the present, we are compelled to take up the assortment of that ill-considered congeries every garment of which, from handkerchief to boots, has its potentialities of mischief.

The connotation of headgear belongs more properly to the tissue which is most usually harmed by it, and is therefore most fittingly considered in discussing the Hair. Its denotation under the names of caps, bowlers, silk-hats, straws, Panamas, &c., is, however, worthy of a reference. In this respect woman for once scores upon every available point of health. Her hat is attached to her hair and not to her head. It for once forsakes the deep-seated feminine

tendency to possess a constricting band, and, indeed, flies so loosely that pins—which pins, by the way, are usually an abomination and a public danger—are required to maintain it upon the head at all. As physical agents towards deterioration, save when placed at such an angle and possessed of such a weight that they drag upon the supporting hair, they do not enter into the purview; nor are we concerned with the morality of the *matinée* hat, or other emotions that may be awakened by it. There are, it is known, questions connected with cost, which will make the following pronouncement regrettable, but it is the fact that the more all headwear approaches the airy nothings fabricated by certain famous French firms, and consists of a feather or ribbon or little else, the nearer such headwear approaches perfection. Gainsborough or Cavalier hats, approximating to masculine tendencies, are emphatically to be deprecated.

At several of the great public schools, for instance Loretto in Scotland, it is the habit of the boys to go bare-headed save on ceremonial occasions, and it has yet to be shown that in their case or that of the Bluecoat boys harm has resulted. But by a curiosity of custom all men must go with covered head in the public streets, and even, by an unwisdom which the profane might readily explain, in Parliament itself. Here we will accept a statement which is later on proved, that no hat is anywhere necessary save for purposes of protection from excessive sun or from rain, so that evidently if hat there must be that covering will be best which is loosest and lightest. It cannot be urged that the head must be covered to protect it from dust and other contamination, since nothing can be said upon this point which does not apply with still greater force to the face—and that is always uncovered. Of all the varieties of men's hats the Panama is the lightest; it is also the easiest fitting; its

colour is in its favour in trying sunlight, and would not be against it in even the murkiest of November days if we were less the slaves of prejudice; it is sufficiently cool to temper the rigours of the Tropics and warm enough for a body-region that actually requires no protection on this account. Yet it will hardly be said that it competes in all-round favour with the bowler, of which all that can be claimed in its praise is that while for every other reason there is nothing to choose between it and the top-hat, it has the advantage over this in being less high and more weather-worthy. Such relative commendation, however, perceptibly decreases in importance when it is realised that, on scientific and sanitary grounds, there is not a single point upon which the top-hat can be eulogised, except that it is not quite so hot as the motor and other caps. The boating-straw is occasionally efficacious in shielding from sunlight through its possession of a brim, and it certainly does not add unduly to the height, but after that all is said that can be urged in its favour, since it is difficult to keep on the head, is by no means as light as it looks, and even when well padded is with difficulty made comfortable in the prescribed form. Caps of every kind, despite that exceeding comfort of the cloth article which is, after all, only relative and connected with the egregious errors of other headwear, are dirty in the highest degree. They consist, at best, of a layer of almost impervious material lying close on the hair, and are in consequence extremely hot and equally unhealthy for the head. The absence of pressure upon the arteries, and indeed of any firm constricting margin, accounts for their popularity, as well as the ease with which they maintain their position on the head, and the advantage of the peak for shielding the eyes.

From the study of the foregoing articles it would certainly seem advisable to ignore the fashion of short

hair, and to take advantage of the possibilities inherent in the natural covering of the scalp, with—as a sop to tradition at first in the case of absolute slaves to custom—the retention of a cap-like form made, however, of totally different material on the essential two-layered plan.

Male upper garments may be slumped as short or long. As at present made they all meet more or less the need of non-conduction and are warm proportionately—a property which is increased when to them is added a silk lining. Mackintoshes and other waterproof fabrics are naturally almost heat-escape proof and prevent all possibility of ventilation; they are evidently adapted to only the most rigorous circumstances of wet and cold. Overcoats of all kinds must be adapted to the necessities of the individual, but it may be noted that weight and warmth are not interchangeable terms. Profit is to be gained by the recollection that air is a good non-conductor, and that excellent materials of the necessary thickness and warmth are readily obtained in cloths which give effect to this knowledge. The ordinary jacket has been evolved apparently in conformity with the requirements of convenience in sitting (*see* "Position") and of a shortness that precludes unsightly creasing. Important regions like the kidneys and loins are insufficiently cared for by even this length, as will be readily witnessed by any one who has experienced the greater value of morning or frock coats; and the front of the abdomen is unduly neglected—particularly in jackets greatly "cut away" in front—while the sciatic nerve and its unpleasant potentialities is quite ignored. If the jacket is to persist as a form of wear for cold weather, then the upper part of the trousers requires a very considerable reinforcement, and should not be made of precisely the same material and thickness as the rest of the suit. The lesson of the kilt should again be applied. The remark will possibly be made that from their position

the kidneys, &c., are excellently well considered ; but an open jacket affords from its shortness ample opportunity for the ingress of cold air to these important parts, particularly when the back of the waistcoat consists of the usual ridiculous chilly flimsiness.

Waistcoats are as absurd as the first garment which approaches the skin of the new-born child. They are thinnest at the back and sides where are situated the bulk of the lungs. They afford no protection to the kidneys and but little to the abdomen. They do not even extend to the apex of the lung, and the apex of the lung is the favourite settling place for tubercle bacilli. This particular garment evidences especially well that although the clothing of men succeeds in attaining the desired ends fairly completely in its mass, it yet does so by extremely devious and clumsy processes in which the main idea appears to be the overcoming of the inefficiency of one section of apparel by the overlapping of another. Very plainly in view of the deficiencies of the jacket the most suitable garment immediately underlying it would be a woollen jersey with roll collar in the American fashion extending well up the neck and of length sufficient to reach below the gluteal fold, where the buttocks merge into the back of the thighs.

For clothing the lower limbs men are limited to choice between knickers, and their accompaniment of thick warm stockings, and trousers which compensate at once for their increased length by a diminution in the foot-wear. There is difficulty in deciding upon either of these as preferable, since if the trouser has its insanitary aspect by approaching so near to the ground, there are yet certain advantages of warmth to be gained by an outer loosely fitting garment if this is of suitable material. Perhaps the best way to settle the question is to imagine that knickers and trousers were made of the same cloth. It is hardly

doubtful then which would be the warmer, warmth or economy of energy, it is perhaps well to repeat, being the test of all clothing after absorption or the necessities of cleanliness have been satisfied. That "turning-up" of trousers at the feet, to which is so addicted the higher flight of male smartness, is as objectionable in daily life as it is found by the management at, for example, Monte Carlo, and for the same reason, viz., that in the fold thus made extraneous articles and material may lodge. The objection to the sweeping skirts which carry so much impurity into a bedroom is sufficiently well known. The amount of dirt that lodges in this turned-up external pocket is notable in even the flattest and best creased garment, and it differs only slightly in degree from that filthiness for which ladies are blamed. Common-sense, if such a quality may enter into the discussion of modern clothes, would suggest that trousers should extend to only an inch or so below the top of the boots, or to reach the shoes when these are worn. If linen cuffs were worn round the ankles as well as round the wrists they would serve as a veritable revelation of the uncleanness of the more ignored portion of our clothing, and on this score knickers, breeches, &c., are infinitely to be preferred. The daily polishing of boots is a hygienic measure of the highest value, and corresponds to the washing of socks, stockings, and underclothes; but the need of such cleanliness does not miraculously cease at the few inches from the ground to which their height arrives, in fact the upper of the boot is decidedly cleaner than the cloth surrounding it. The least attention, then, that hygiene demands is a rigorous daily brushing of such cloth, and surely it need not be added that the brushing must not be done in any bed- or other living-room; if no other place may be found, there is always a cellar.

The proper warmth of body having been secured by

a judicious system of external apparel, the needs of the skin on the other count will be satisfied if "sweatiness"—to give an unpleasant condition its properly unpleasant name—is avoided, the witness of evident perspiration being the test of the suitability and efficacy of the absorbent layer worn by any individual. Here also the clothing must be guided by the special reaction of the skin—the cutaneous idiosyncrasy, in fact. The need being understood, however, there is no excuse for any man complaining of his underclothing, as this can be made of any material in any texture, and there is no longer any need to restrict oneself to the presumable impeccability, with its undoubted discomforts, of wool, since cotton, linen, and silk of the same value for the purpose may now be obtained.

Upon one point specially applicable to men there is distinct need of criticism. Of what avail to wash one's hands carefully and then to embroe them with the weeks of accumulated dirtiness contained in pockets? Money, keys, letters and hands themselves, all contribute to the condition, and though the word "detachable" has been used to the limits of the reader's forbearance, it is really called for again. The trouser pockets, especially beloved of men in their impermissible lounging, are the chief offenders: there is no need for microscopic examination here. Simply turn them inside out in a suit that has had a few weeks' steady use, and the dirtiness will call aloud. They truly require washing as much as any underclothing, and should be framed accordingly.

In a category by itself must be considered the white shirt and its appendages, the collar and cuffs. Probably no article of clothing has been more maligned, and probably no garment is more useful when it is used properly. Misunderstanding of it has arisen from a misapprehension of its scientific function, which is that of revealer of dirt.

The essence of its being lies in its spotless cleanliness, and the readiness with which this is marred as witnessed by tell-tale cuffs and front is all to the advantage of the body. Detachable cuffs, as tending to ignore the value of the white shirt, are deplorable; and it is to be regretted for the same reason that the collar is not also an inalienable part of it. The daily interposition of one absolutely clean garment between the ingrained impurity of the outer clothes and the semi-saturated layer of the underclothing is of great hygienic value to the body. As an article of genuine clothing it is of course contemptible, as it is neither absorbent nor warm, save where it is made impenetrable in front by starching: the degree to which the starched front is resistant to cold when caused chiefly by a brisk wind will be vouched for by any man; but, as explained, its chief use is as an interceptor and indicator of dirt, and to make it responsible for any other duty is a mistake. In summer the anterior impermeability is a natural obstacle to the great evaporation that should then be allowed, while in winter its warming power is negligible. With our present sartorial methods—this limitation must be noted—and as an assistance to that condition of cleanliness which has always been ranked as second in human desirability, it is of distinct value. Where the cutting away of coat and waistcoat amounts to more than a small “v” it does undoubtedly predispose to chest complaints, but with only a small opening below the collar, sufficient merely to mark the condition of the underlying linen, little harm is likely to ensue, on account of the previously noted posterior distribution of the greater part of the lungs.

It will not be inappropriate to consider with the “dress-shirt” the matter of evening dress, and this habit may be at once heartily commended. The change of garments,

with its accompanying enforcement of ablutions that might otherwise be neglected, is extremely praiseworthy : it results in not only a change of clothes, but a complete change of the layers of air which rest comparatively stagnant between the different garments, and the skin and the individual cannot but benefit by such change. The effect is known to every one who follows this admirable daily custom, and to the actual physical benefit is added a more subtle emotional stimulus, due in some cases to the intangible alteration of the mental and cerebral attitude by the immediate corporeal environment.

Evening garb itself is a very different matter, particularly the feminine variety of it upon which so much war has been waged : it cannot be denied that the famous witty apologia of more than a hundred years ago is as applicable as ever, and while it defends, yet defines, the point of attack :—

“ In an evening dress, the nymphs nowadays,
Scarce an atom of dress on them leave ;
Nor blame them—for what is an evening dress
But a dress that is fit for an Eve ? ”

To attack a manner of clothing which lends itself to such definition is clearly entirely superfluous in a country which exacts such respiratory death-toll as England. While, indeed, change of dress after the day's work is praiseworthy, and while naturally the texture of clothes which are intended to be worn indoors may with propriety differ greatly from that of those designed for the varied requirements of the day, there is only custom to ban us from selecting any form or colour we choose for evening wear, and the exuberance of shirt-front with which evening afflicts men is little more sensible than some of the follies of women. Apart from this masculine conceit, which attempts to vie with the

glamour of white arms and shoulders, there is little to be noticed in this department if the canons of warmth, &c., are attended to.

The masculine collar, day or night, is a thing apart from all reason, but in this quarter there is promise of the introduction, according to one of the tailoring papers, of a soft silk article which is expected to become fashionable. If this is so, it takes the sting to some extent from any diatribe. The utmost that can be said for the stand-up collar, whether turned down in front or all the way, or maintaining an inviolate rampart all round the neck, is that once used it will if discarded be missed: that also, however, applies to opium and many other objectionables. The starch or chemicals of the collar have been indicted for the noticeable tendency in many people to grow boils and carbuncles at that part of the neck which is menaced by its edge: the, irritation of friction alone, however, will account for these. As a stiffener of the neck and a limitation to movement its defects are obvious, and it may, as has been suggested, assist any tendency to round-shoulders. It has no good qualities (other than that commended previously in connection with the white shirt) which would not be possessed in higher degree by a soft woollen or silk material, and has every possibility of costliness, inconvenience, and clumsiness that can be conceived. Garters of any kind for either sex are harmful, since constriction anywhere in the body cannot be beneficial or negligible.

With the exception of the braces, sufficient attention has now been paid to the epi-cuticular accompaniments of man, and this point has been so thoroughly ventilated and amended of late that beyond agreeing with the suggestion that crossed single braces are best, and that braces are always preferable to belts, there is nothing

more to be said : it may be worth remarking that a certain amount of elasticity is desirable in these structures, and indeed in all clothing.

So much has been said concerning the desirable in costume in discussing male garb that from this may be deduced the necessities of women, and the extent to which their present habits conform to them. Such monstrosities as openwork blouses, openwork stockings, meaningless garments without sleeves, corsets, abdominally suspended skirts and petticoats, skirts extending to the ground, &c., sufficiently condemn themselves. A modified kilt, or the ordinary walking skirt slightly shorter than at present, would preserve that lack of bifurcation which apparently is requisite for the manifestation of sex, and with satisfaction of the other essentials which have already been prescribed to weariness, there is nothing to add.

A vicious standard of feminine beauty definitely attributable to the morals and demands of men, has preserved some form of wasp waist for at least thirty-five hundred years, with the corset that accompanies it ; and once again it is rumoured that this special deformity is to become fashionable. Fortunately red noses, palpitation, greasy skins, ovarian and uterine troubles, premature wrinkles, grey hair, varicose veins, hæmorrhoids, &c., are as little in vogue as ever they were, and as science is at last able to trace a definite relation between the objectionable garb and this grisly list, we are in a more hopeful position than previously to expect with some confidence that if intelligence would permit its return, a salutary emotion of fear may have some share in prevention.

Athletic garb proper, as it refers to "athletics" in the sense that these were understood by ancient Greece, while in those days it resembled that in which "Mulaney took Lungtungpen," is simply, in our time, that minimum

which meets a modern canon of decency. For less strenuous pastimes the attire will conform to the occasion and the principles enunciated, it being once more observed that flannel for even the cricketer has been displaced.

It was, I think, the late Mr. Gladstone who bewailed the fact that the outfit of the modern undergraduate, as he stood, could be represented in value by a five-pound note; but on this flimsiness or cheapness as it indicates lack of durability we have sincerest reason to congratulate ourselves. Our fathers built clothes as they built houses, to stand or to wear for ever; but, even living a comparatively country life as they did, such clothes could not fail to become intolerably dirty. We know that a rag doll is efficient to cause a zymotic outbreak six months after it has been used by an affected child, and there is little doubt that certain inexplicable past calamities in the shape of infectious disease have been due to carefully hoarded clothes; the famous plague outburst at Eyam was attributed to such a source. If it is desirable to change and wash the underclothing at least once a week, it is quite as desirable to treat our outer coverings in the same fashion. So that if it is not soon made possible to act upon this principle, we may hope that the ever-increasing tendency to cheapness will at last result in a new suit once a week ceasing to be an extravagance. This at present is a counsel of perfection, but any tendency towards making clothes more lasting is emphatically to be condemned, while everything that makes for their cheapness is in the direction of cleanliness and better sanitation, and therefore to be heartily encouraged.

If the practice were insisted on of workmen wearing washable overalls, the English streets and public conveyances would be greatly improved in appearance and the workmen themselves be encouraged to cultivate a greatly needed self-respect; at present, on account of the lack

of such protection, they are an offence to every bodily sense, and a menace to every attempt at sanitation. In the same direction it would be worth investigating whether a cheap daily renewable substitute for the frequently filthy apron of many shopkeepers might not be found.

CHAPTER VII

THE SKIN

The beauty of health—Conditions revealed by the skin—Temperature, tactile and heat mechanisms—The epidermis—The corium—"Finger-prints" and the "lines" of palmists—Keratin, hairs, sweat and sebaceous glands—Examples of neglect—The action of clothes upon the skin—An essential is absorption—Washing.

Soap.—Is a chemical application—"Running" water—No soap user can possess a normal skin—The mode of action of soap—Medicated and antiseptic soaps are largely futile—Difficulty of antiseptics.

Anointing the body—Pliny.

The Face.—As region of "objective mind"—Expression and beauty—"Bell's Palsy"—Physiognomy in infants—Of disease—Facial habits of expression as affecting the skin—Wrinkles—The Autocrat of the Breakfast Table and "Old Age"—Spencer and hard thinking—Elasticity of the skin and strapping—Steaming—Face-massage.

Diet and Beauty.—Creams and powders—Pastes—Glycerine—Acids as astringents—Paints—"Tattooing"—A freezing necklace for hot weather—Arsenic.

Minor Afflictions.—Sunburn—Freckles—Acne, or pimples—Warts—Moles—Double-chin—Dusky skin.

The Lips.—Warning to smokers.

THE æsthetic possibilities inherent in a well-kept skin have fortunately come to the aid of a necessity which might have become disregarded on grounds of mere utilitarianism, for it is, of course, not at all uncommon that the claims of the unseen should be ignored. Fortunately, also, as there has elsewhere been occasion to note, the beautiful in the human body bases its chief appeal in so far as it is the expression of health. So that a "good"

skin cannot be other than a healthy one, though it hardly needs stating that the expression of health varies with the individual, and that equal degrees of health are not necessarily represented by the same appearances. Any attempt, therefore, to make, for instance, the complexion of a dark, coarse-fibred brunette take on the texture, finish, and gloss of a more fortunate thin-skinned and fairer sister is, in the nature of things, doomed to failure which no amount of strapping, steaming, and skin feeding can overcome. What is possible, however, is that every one may possess a healthy, properly acting integument, though naturally, by reason of the interdependence of all the parts of the human organisation, this is not likely to be secured by attention to the skin alone.

Anæmia with its pallor of skin and mucous membranes; jaundice and its distinctive superficial tinting; constipation and other defective intestinal actions and their resulting muddy or earthy complexions; with a host of others, write their history plain to the most casual observer. The skin, like the eyes, bears faithful witness to the various carelessness and imprudences of life's conduct, but it has rather more concern than these in so doing—a condition enforced by the greater dependence of the body upon it. The seat of innumerable nerve endings; the fabric upon which abut over ten thousand square feet of sweat orifices; the groundwork in which are set hundreds of thousands of hairs, the skin is at once protective to the whole body, the principal regulator of its working heat, and the most important and fundamental of the mechanisms by means of which man attains to a harmony with his environment. Consider the helplessness of man were he unable to distinguish by the nerves of his skin between fire and water—that would be a short shrift indeed; or, what would result if there were no warning of what is painful, and to the natural man, therefore, necessarily harmful; or, again,

what would happen if he were deprived of the sense of touch. Yet all of these matters depend first of all upon the state of the skin. Cool it too greatly, and a finger will be lost without pain or warning. Heat it beyond that point where it can control the internal heat, and by widened vessels and increased perspiration justify the statement that man is homoiothermal, and apoplexy and death will follow. Thicken it unduly, as occurs in that curious and rare condition called "scleroderma," and all bodily movements become difficult and finally impossible, from the resistance offered by this "hide-boundness."

It may be suggested that there is here considered more than can properly be termed "skin"; but that superficial, slightly greasy surface, clothed with an impervious coating of horn or keratin, is not skin proper at all. This, with a few other cell layers also more or less converted into keratin and the strata from which they are derived, is merely a skin product directed towards its own protection, and is, in fact, precisely what its name indicates—"epidermis"; the epidermis it is to which all the art of cosmetics is directed—from its constitution it is evidently a thankless subject—and, while the true underlying skin, the "dermis," can be but little benefited by any operations upon the intact epidermis—when certain main principles of bodily health are excepted—it may yet be greatly harmed. The outermost layers of epidermis consist of dead cells, united in one continuous, impervious membrane, save where their continuity is interrupted by the openings of sweat glands, and the exit of hairs with each its own sebaceous follicle. Deeper, the epidermis is formed of living, more or less discrete, cells, from which the outermost are progressively renewed—a physiological fact which gives some force to the saying that a man changes his skin every seven years, the actual time, so far as outer epidermis is concerned, being very much less than that.

The corium, dermis, or true skin, is responsible, as well as for many more important matters, for the follies of palmistry, and for the instrument it has afforded us in assisting to detect crime by means of finger-prints. It is a fibrous layer with much elastic tissue exceedingly rich in blood-vessels and nerves. From the "lines of cleavage" in this fibrous material are naturally determined the special directions in which skin folds shall occur, those of the hands being included ; and from the arrangement of the nerves to project upon ridges—which ridges are naturally the more numerous where the nerves are most required, and tactile sense most important—arise those whorls and patterns that are so distinctive of the fingertips. This will serve to explain why the lines of the hands, no more than the prints of the fingers, can be altered by any destruction of the skin which does not proceed so deeply as the dermis. Their development depends upon more deeply situated nerves, and, while these nerves are intact, skin-folds and papillæ will persist. Without any admission of the wilder implications of palmistry, "reading" these lines in the palm may be admitted to give a certain amount of information—the most clearly defined of them will evidently correspond to the flexures of the hand which are most decisively performed ; a definition which will be assisted if the skin is of the proper well-fitting elasticity. With a skin relaxed, sodden, or unhealthy from any cause, and in a person who performs few actions of the hand which include firm grasping, it is easy to perceive why creasings will be shallow, indefinite, broken, &c. From such data it is not difficult to guess at some part of the past, and upon such past to base an imaginary future. It has been stated in proof of the "effect" of the lines of the hand upon the individual during life, that these disappear at death—presumably when their work is done—there is a simpler explanation of

such supposed phenomenon in the general pallor of the skin obscuring them.

Any curiosity as to the notable singularity of pattern of the finger-tip papillæ is readily answered when it is remembered that no two individuals can be twin in their life or development, however closely they may seem to approximate to this.

Dead and living epidermis with hairs, sebaceous glands, and sweat ducts being all dependent for their blood and nerves upon the deeper dermis or corium, which draws in its turn from the blood supply and nervous force and material of the body, there is no difficulty in perceiving why the rational treatment of the skin is through the preservation of the health of the body. Beyond keeping it warm, clean, and uninjured there is no direct method of benefiting the skin, and the extremely numerous devices which form part of the routine of even those of us who are aware of this truth, arise solely from our failure, conscious or unconscious, to put our theory into practice, with consequent deficiency in appearance or action of parts of our surface, and a natural endeavour to compensate for a general or local neglect by a local treatment.

So general a statement as the foregoing requires probably some amplification, but, if the life of the average man or woman be taken as a criterion, its implications will be readily perceived and accepted. Deficiency of clothing, or dirty, unsuitable or excessive clothing, will each account for its special skin sequence such as chilblains, harsh or "chapped" hands or features, ringworm and other parasitic diseases, oily skins, hyperidrosis or excessive sweating, corns, and so on. Too limited a use of water as well as, be it noted, too much washing, will tend to definite lesions, while there is more than an academic importance in the question of the kind of water employed and the composition of the soap that is used. When so

much has been admitted it is, then, after all, necessary to take separately certain conditions which we have to remind ourselves have actually to be guarded against ; a necessity which is enforced, not only by a very general lack of physiological knowledge, but also by want of acquaintance with the materials employed in the prosecution of this quest of health.

The bearing of clothes upon the health of the body has already been considered, and here it only needs to be repeated that the layer of these which comes next the skin must be clean and absorbent—a desideratum not singular to, or even always possessed by flannel or woollen materials—also, it should be comfortable. Lack of absorptive power of the underclothing means accumulation of sweat as well as of the oily matter from sweat glands themselves and the sebaceous glands, resulting finally in the formation of an actual liquid or semi-solid layer upon the skin, and interference with the sweat secretion ; carried further, actual blocking of sweat and sebaceous orifices must ensue, not only from mechanical stoppage of these, but by the swelling which results from the absorption of the oily secretion by epithelial cells, with a still greater damming back of the water that should escape from the body ; the heat-regulating mechanism is thrown out of gear and the kidneys overburdened with an excretion that should not be their concern. At the same time, an oily surface of this nature, containing as it always does numerous micro-organisms, with the friction of the clothes continually playing upon it, is an admirable medium for conveying such organisms or their toxins into the deeper layers of the skin. For an excellent example of what can be done in this direction the old-fashioned, red flannel, non-absorptive “chest-protector” cannot be excelled. The wearers of it are more liable to chill than any other class, and in all of them is usually a definite

skin rash, as might be expected ; if the actual rash is not present its beginnings are readily to be observed in the existence of numerous "blackheads" of the same nature as those which at puberty curse the careless of the male sex by causing pimples or acne.

The influence of water upon the skin was dealt with in discussing bathing, but, apart from the effects of cold water in stimulating the skin of those whom it suits, and of hot water in cleansing, it is not to be forgotten that water as we receive it from the tap is not simply H_2O , and that there is a difference between the water which is most suitable for drinking and that which serves best for washing. Country rain-water is most desirable for toilet purposes ; country, since such water will have picked up fewer impurities from the air ; and rain, because all flowing water contains—apart from any organic matter—a certain proportion of lime and other salts which make it "hard," and hard water is the least efficacious for cleansing purposes as well as most damaging to the skin. Soap is so universally used that washing has come to indicate its combination with water, but this connection is a matter of convenience and not of necessity ; it is more than doubtful if it is the best treatment for the normal comparatively clean skin.

What should be aimed at in washing is simply the removal of all matter superficial to the outermost layer of the epidermis, and this with a minimum of effect upon the epidermis itself. The persistent application of chemicals, and that is what the use of soap amounts to, can hardly be regarded as a mechanical process of this desired nature. Soap, for example, in Old Testament times was not at all the article of modern use but probably a mixture of fine ashes ; and of the value of such a powder many smokers are still aware, since they utilise their cigar ash in brushing their teeth. A similar mixture with similar action is that

handful of fine oatmeal which is frequently prescribed to be used instead of soap where there exist certain irritabilities or lesions of the surface.

Water alone has insufficient power to remove oily secretions, and the colder the water the less its effect in this regard, though with impact and friction it may well serve for the rougher forms of cleanliness. There is sound reason for the Mohammedan objection to water other than "running" for toilet purposes, though the force of custom makes us quite content to end our washing, in the majority of cases, with water that has been dirtied. Presumably we trust to the towel to cleanse from this dirty water. The rational method followed by a few is to use a second basin or bathful since the utilisation of the running tap is neither so convenient nor economical. But certainly one attack alone must leave considerable impurity behind.

The faithful user of soap, of whatever degree of refinement, can hardly hope to possess a natural skin, and that this is recognised by the most ardent devotees to the complexion has been instanced in all historical times as well as in our own by the substitution of such freakishness as complete milk baths, rosewater baths and the others, blood even having been employed. None of these can compete with the simple device of finely-ground oatmeal in water, but there are few who have the patience or the time to spend over a cleanser whose action is not traceable by its lather. It is not, then, expected that soap will be displaced, but it is advised that more care be taken in the choice of this, and such care, it should be needless to add, will best begin with the skin of the infant.

The best soap will contain a minimum of free alkali, and must justify the title of "superfatted," and with it warm water must be used for it to cleanse sufficiently. A very little consideration of the effect of alkali upon the skin will explain the force of this stipulation: there is no need

of its presence in an uncombined state since, when soap is dissolved in water, it splits to a certain extent and liberates some portion of the alkali composing it. The action of alkalis in any strength is that of an escharotic or caustic: their tendency is to destroy all proteid or albuminous surfaces by dissolving them, and on account of their power of saponifying fats it is clear that they will produce a weakening and penetrating effect upon the skin. By the action of alkali upon the sebum of the skin has been explained the cleansing power, but this may probably be quite as much due to the ability of soap to emulsify or break up into innumerable small globules, the oily *débris* incumbent upon our surfaces.

Absence of free alkali is not, however, the only essential to be considered in the choice of soap, and, if this factor alone be investigated, disappointment is quite likely to occur from the use of an article which, while its advertisement on the point may be perfectly accurate, is yet found to be quite as irritating as others not so purified. The fatty basis of the soap is of equal importance, and care must be taken that this has been neither unsuitable nor rancid.

A recent agitation is still so fresh in the mind of the public, with the exposure simultaneously made of so many tricks on the part of soapmakers, that there is not needed any elaboration of what constitutes a good article. Water should be at an absolute minimum in the soap itself, and the lasting power, with an unchanged condition till the tablet is a mere wafer, is the best test of freedom from this sophistication. Cocoanut soaps are particularly suggestive of dishonesty from the ease with which they may be made to contain a very large proportion of water, and yet remain perfectly hard. But cocoanut soap has its use, since it can be utilised with salt water. Yellow soap contains resin, and a mottled soap is not, as it used to be, a comparative

proof of purity. Strongly scented soaps are always objectionable, not merely from their smell but because the object they have in view is simply disguise, while medicated soaps are largely futile. As this is very much an antiseptic age, the last statement will probably be impugned, but it is possible of the easiest of proof, and for it we have the supporting authority of Norman Walker, who says: "Theoretically, soaps should be more useful as vehicles for drugs than they are. They do not in practice prove as satisfactory as they do in theory." One of the best antiseptic soaps that is made contains, the makers claim, some 5 per cent. of carbolic acid. Assuming that it does so, and that all of this is available for forming an antiseptic solution with water, the total amount of it even then is ridiculous. If the cake of soap weigh four ounces, then it will contain one-fifth of an ounce, or call it one hundred grains weight, of carbolic, which is just enough to make a nice, harmless strength of antiseptic lotion with a pint of water. Yet at each washing of the hands in which this soap is used a pint of water or more is poured into a basin, and the small portion of soap that is dissolved to make the lather is supposed to form an efficient defence against organisms! Ludicrous! To make your soap of any value in such a connection it would be necessary to dissolve a four ounce tablet of it in each pint of washing water.

I will admit that medical men gravely perpetuate this fraud by recommending such antiseptic soaps, but the root idea in their minds is not that of the employment of an antiseptic, but the persuasion of the public to take the ordinary pains over securing clean hands, which they can readily obtain by the use of any ordinary good soap. Walker again says: "They (medicated soaps) have their chief sphere in cases where the action of soap as soap is desired." It is found, however, that the public may be

tempted better to this routine by that blessed word "antiseptic." It would be an education to any who may still have a lingering belief in their carbolised, hydrargyrised, eucalyptised and other innocuities if they saw a surgeon preparing his hands before an operation, in a genuine attempt to eliminate all possibility of his conveying infection by bacilli from his skin. This is a rite which takes some ten minutes for its thorough performance, and involves the efficient use of soap, hot water, and a nail-brush—to hands as well as nails ; the using of alcohol, ether, terpene, or some similar efficient solvent of the oily material of the skin ; and finally a solution of such powerful antiseptic as corrosive sublimate in a most effective strength. I must admit that when I have seen the trouble which is taken to arrive at the deepest possible saturation of the surgeon's unfortunate epidermis with antiseptic, &c., that I have sometimes wondered whether, if it is so difficult to get at the dreaded organisms, it would seem likely that it might be more difficult for these to get out than would be probable to occur during an operation where the hands are bathed by no more penetrating fluids than blood at worst. That, however, is perhaps hypercritical, and probably the painful is the best course. The American surgeons believe in it, as is evidenced by olive-tinted half-moons projected under their finger-nails by the deposition from frequent use of metallic salts.

This, fact, however, can be allowed to stand by itself, that good soap is an efficient cleanser, and requires no subtle advantage of combination with infinitesimal quantities of antiseptic or other medicament.

Anointing the body has been practised from very ancient times, and the oil with which the heroes of Greece were saluted at the hands of fair maidens, on their return from their various Odysseys, has its counterpart to-day in the cold creaming with which the lady of fashion refreshes

herself after her late nights. Before athletic contests, too, it was the habit in the older times to rub oil into the body, though for this purpose it was roundly denounced by Pliny as an error imported by the Greeks into the gymnasium, whilst other philosophers considered oil the medicine of madness on account of its effect upon athletes. As an advantage to wrestlers one can readily see the value of an oily skin, and also its use in warding off cold from those stripped for their contests. There can be little reason to doubt, however, that in the actual treatment of the skin and body by rubbing, the oil was useful simply as allowing this to be done without skin irritation. Oil on the healthy skin is useless. Cold cream comes into a different category, but as we are now approaching devices which are especially applicable to the complexion—as the skin of the face has limited this definition of appearance—it will be more convenient to discuss this and the remaining skin applications under the heading of the Face, remembering always that there can be no distinction in the effect here and upon the rest of the body except as it may be modified by the wearing of clothes, for the face is always naked and unashamed.

The Face

The face is the most important of the regions where may be observed "objective mind," as Clouston terms it. For, though the poise of the body, the movements of the hands, the turn of the head, may each have its share in producing an expressional effect, it is by the muscles of the face that we can still convey the greatest number of explicit messages, without the intervention of speech. Undoubtedly this ability to reflect psychical states by material muscular groupings is becoming less and less valuable, since after all it is an exceedingly inferior method of communication, but the retirement of facial muscles

into the limbo of vestigial obscurity has been postponed indefinitely, on account of the discovery made by man that there may be a beauty of expression, such beauty depending upon the preponderance of special muscle groupings. The blank face of ignorance, or idiocy, shows readily how astonishingly much of beauty is to be ascribed to the action of muscles of expression. That condition called Bell's paralysis may give in the one face the two conditions of these muscles: on the one side the unlined smoothness of blankness, on the other the normal appearance of active intelligence. This condition, it may be noted, can readily be produced by a chill of the seventh cranial nerve as it emerges from below and behind the ear upon the face, and its occurrence suggests that there are limits to the endurance of exposure of which the face is capable: its skin must not be allowed to become too cold. Certain badly constructed public halls, in which the audience is perpetually exposed to a searching draught of chill air from one side, have been responsible for almost epidemics of this Bell's palsy. For a complete exposition regarding the fifty muscles of expression the reader is commended to Clouston's "Hygiene of Mind": their action comes into our subject as they affect the skin above them, the expression and lines of the face, and as a direct sequence one's actual life. "My face is my fortune" might well form the subject of a not uninteresting philosophical discussion.

In infants, on account of the naiveté and shamelessness with which they enunciate immediately any emotion of injury, joy, or complaint, physiognomy approaches to an exact science; and in them the physician may readily perceive facial indications of many diseases. Abdominal troubles, for example, draw oral lines of suffering; respiratory affections have their nasal signs, and brain irritations are indicated by a most unchildlike frown. No more

need be said than that the expression must be placid, and all that makes for joy made possible to the babe that its features may not bear an irremediable imprint of suffering. Facial habits are soon acquired, and while the undesirable ones definitely mar beauty, they have a reflex effect upon the individual which is all for harm.

It may be suggested that this scarcely partakes of the inner nature of a consideration of the skin, but facial skin is our only guide to the underlying condition, and we have a right to know that if the face be amended in this respect, while we have satisfied the critic, we have also attended to the care of the body.

The notorious unwinking stare of those of our race who thus convict themselves of possession of the highest "ton," and the general unemotional appearance of the typical English of either sex, as understood by critics from abroad—occasionally characterised by them, too, it is a pity to add, as insolence, though we naturally prefer to denominate it as "hauteur"—arises, we like to believe, from a high appreciation of an unlined skin, and not from vacuity or hardness of heart or head. It is also, one has heard, "bad form" in some circles to laugh outright, or to smile beyond a certain delimited expanse; and if this is so the same explanation is probably applicable. There is no doubt that any one who smiles by elevating his cheeks, and crinkling the skin horizontally at the outer margins of his eyes, will sooner or later be afflicted with wrinkles. It is true that there is compensation in the kindliness of expression that this skin distortion effects, but that may not appeal sufficiently to those who prefer not to carry such a certificate of character perpetually with them.

This, then, it is which necessitates careful attention to the muscles of expression that are most frequently used, and the manner of such using, that wrinkles may be avoided, or those alone incurred which shall be least dis-

figuring. The primary consideration is of course to avoid their formation by supervising the expressions, and consequently the states of one's mind, a matter which goes very deeply into hygiene, recollecting also that there is no more efficient solvent of frowns and wrinkles than refreshing sleep. But the skin itself has a say in the degree of readiness with which the folds in it induced by muscular action shall be stereotyped, by its inability to eliminate these when the muscular action has ceased; and this will depend upon its health and elasticity. Age, we are accustomed to say, brings wrinkles, but in this as in other things we are the slaves of a word, and should realise that time is merely a convenient form of thought and not an entity. Use will cause them, misuse more than all, but time has no more to do with it than it has in terminating our lives. *We* do it, if you like. Three straight lines running up and down was the visiting card used by Old Age in the "Autocrat of the Breakfast Table," and old age according to Wendell Holmes begins at forty-six. We are indebted to America or Canada for some curiously depressing suggestions, *pace* Dr. Osler. The brow of Spencer was, however, unlined to practically the end, and this he himself explained by never allowing himself to sit down to what is termed hard-thinking. His recipe is worthy of study. Having thoroughly perceived the problem that has been set, and being satisfied that the solution is possible from the contents of one's consciousness, then—if the answer does not readily come—leave it alone. He believed fully in waiting, if one were equipped. "Don't worry," therefore, after the fundamental rules of health, is the first of all maxims that concerns the facial skin.

It has been said that elasticity is a most important requisite for recovery from any of the set lines into which the skin may be thrown, and the maintenance of such

elasticity must be at the basis of all cosmetic treatments which are not to do harm. Firm strapping of any part of the face will clearly interfere with this property; and, while it can undoubtedly remove temporarily—by its mechanical pressure—certain skin elevations or depressions, as well as excessive fat (though not by “melting it away”), it will most evidently add to an already existing lack of tone, with a future increase of the evil it is supposed to attack. To those who are content to recur to strapping for the rest of their lives this will not appeal, but it may have weight with others who have been led to think that as a temporary application it can lead to “cure.” Since wrinkles depend partly upon relaxation of the skin and partly upon relaxation of some muscles accompanied by over-use of others, an effective treatment must include all the factors.

Steaming the face will attend to a general relaxation, will “open the pores” and soothe the muscles, but it has in doing this done no more than is attainable by a hot face bath. From the extent to which the face is exposed, and the greater necessity thereby enforced of frequent washing, it is essential that the water should be soft as well as warm, and a superfatted good soap used for cleansing. It is in the softness of steam—which, of course, cannot contain the mineral salts which no tap-water is without—that there lies an unquestionable advantage with the former. But whether steam or warm soft water be used, it requires to be followed by the bracing effect of a cool water, which also, of course, should be soft. An occasional intermediate process of great value is facial massage, and to assist this the smallest possible quantity of pure olive oil. The oil is not intended for absorption; this is not necessary with an ordinary skin, and is of doubtful value with any except the excessively dry, but it affords a preventive

of abrasion and irritation during the massage. Such massage requires a knowledge of physiology or anatomy, or at least of the complicated lines of lymph and venous flow—which, it is needless to add, the ordinary hair-dresser and beauty doctor does not know—otherwise its value is greatly nullified. The object is to promote circulation by advancing the fluids of the skin and not to retard it by pressure in the wrong direction; and it should further be added that there is something to be learned in the manipulation itself. Of the value of such massage there is no doubt and, indeed, no dispute, and when efficiently performed it is most soothing.

To wash the face in hot water and thereafter go out walking is foolish and an invitation to the acquirement of a bad complexion, in towns especially; and, on the other hand, cold water is no cleanser except when neutral or alkaline soaps are used, and against these the objections have already been noted. Those who are so careless as to apply oily dressings will need to be reminded of the affinity of these for dirt.

The preceding remarks have been devoted to individuals who find it necessary to pay special attention to the complexion, though it is understood that attention to diet, &c., will have rendered it unnecessary in probably many cases. So far as diet is active as a beautifier only a word is permitted here. Alcohol is absolutely condemned from its dilating effect upon facial, and particularly nasal, blood-vessels. Meat should be limited to its minimum. Milk, fresh fruits, and vegetables are the best staple, with bread, cereals, and fish, of course, of any diet. It is unnecessary, however, to limit one's self to a single article in a despairing attempt after beauty, despite the quoted example of "professors" interviewed on sea-fronts who manage to subsist upon three gallons of milk a day, or the lives of ladies who die at one hundred and

ten and thereabouts and who possess the skin of a girl of twenty by virtue of living forty years or so on milk. Milk is an excellent adjunct to the food of civilisation, but it can hardly be expected that any one should hanker after the dilated stomach that must follow the imbibition of such quantities. Dyspepsia, needless to say, vies with alcohol in its production of unbecoming nasal tones.

For their pleasant, cooling, and sedative effects, as well as for their presumed influence in securing an approximation to the natural bloom of a well-cared-for, healthy skin, creams and powders of many kinds are in large feminine and other demand, but these also have their demerits. The typical cold cream is the pharmacopœial unguentum Aquæ Rosæ, and such creams are not intended to be used like ointments and rubbed in. Unna, the great Danish skin specialist, explains their action in terms of their content of water; they are best applied by thickly smearing the skin; by the continual evaporation of water from the large surface thus presented to the air, and a compensatory removal of water from the underlying skin, they give the pleasant coolness for which they are intended. Pure oils, fats or grease, when rubbed in, enter the superficial cells, and to dry skins are to this extent therefore beneficial; to a healthy skin they are harmful, for the same reasons as led us to condemn the chest-protector. It is worth noting here that there is no substitute for vaseline—many imitations to the contrary. Powders act by absorbing perspiration and other liquid material of the surface, and unless in excessive amount they have not the failing of ointments in damming back secretions, but when used for this purpose, especially if the weather or the state of the skin actually calls for their use, they rapidly become sodden and proportionately useless and deleterious. There is little objection to the faintest film of powder on infrequent occasions; in addition to sopping

up fluid it relieves the skin of irritation, contracts the vessels, and cools it. Carbonate of magnesia is one of the best simple dusting powders in virtue of the large amount (five and a half times its own weight) of water with which it can deal, whereas oxide of zinc takes up only a quarter of this quantity. But orris and other vegetable powders having no chemical action are safer. Pastes are mixtures of oily materials and powders, and have action accordingly ; their characteristic is the large amount of powder they contain. Pomades usually contain coca butter, so that their action will be evident. Glycerine is one of the commonest and at the same time the most mistaken application to the skin ; many it irritates, while others, from which it undoubtedly draws water, suffer afterwards from the extraction of so much fluid ; pure it should never be used.

There is an old remedy for excessive and general bodily perspiration in the bath containing some three ounces of strong nitric or hydrochloric acid ; it acts by astringing the skin and contracting superficial vessels, but from its nature will be seen to necessitate only few and infrequent applications.

Paints, dignified by whatever name (of which pure rouge is the best), varnishes, enamels, and the rest require only the mention of condemnation. Rouge, however, is being supplanted by the ultra-refinement of the deposition of coloured particles within the skin by means of the electric battery. This form of tattooing—for that is what it amounts to—will certainly, under antiseptic precautions, do no harm if the proper materials are used ; though the advantage of a perpetual blush upon the skin in all circumstances would seem to be questionable. Powerful some of these paints are, as is proved by the story of the famous lady who demanded to be made beautiful even at the expense of life, for one triumph only. Lead-poisoning has been known in this connection.

I would suggest that the difficulty of keeping facially cool in midsummer, especially when any exercise is taken, may be met in the case of ladies by their wearing a necklace containing a freezing mixture. This is not at all an invention beyond the ingenuity of the shopkeeper, and its effects, as shown by the device of wearing a pad of wool soaked in iced water behind the ears, would justify the trouble. The idea is, of course, to cool the great carotid arteries (this is not quite scientific, though for the sake of brevity it may serve) which send blood to the head and face, and is similar to the endeavour which is made by dabbing on cooling evaporating lotions or by fanning to keep the "blood cool." Every one knows the relief that is obtained in hot weather by soaking the wrists, which means the radial and ulnar arteries, in cold water. The same ingenuity may be invoked for discovering a warming apparatus to prevent the pinching of the skin and features of winter; we have already heaters that may be carried in the muff.

It is, perhaps, deserving of mention that arsenic is credited with the production of the wonderful complexions of the Styrians, but their prowess in consumption, amounting to even two or three grains daily, will not, it is hoped, be emulated by any Englishwoman, since the lethal dose of this poison is approximately one grain. Small medicinal doses of arsenic are excellent as a tonic to general health, and doubly so, therefore, to the skin.

Minor afflictions, distressing enough, no doubt, to those who can permit themselves the luxury of such griefs, are innumerable. Sunburn caused by the chemical rays of light, and freckles, of which the temporary are similarly caused (the permanent, of which we have as little explanation, are much more intractable), are usually amenable to simple treatment like that of weak organic acids such as are contained in buttermilk or watered lemon-juice, or to

borax, &c., &c. ; it must be weighed, however, whether the roughening of the skin that may be caused by unskilful use of even these remedies may not overbalance the defect itself. Broad-brimmed hats and parasols have been designed to obviate the necessity for such cures, and though ladies are slow to believe it, sunburn has its own beauty, so long as an actual erythema does not follow. Cold creams have here a distinct sphere of importance.

The prevention of acne or pimples, as arising always from a preliminary "blackhead"—meaning a sebaceous gland blocked with oily material and dirt, in which necessarily bacilli find an excellent nidus—has been already sufficiently indicated. Their special occurrence at puberty is decided by want of so careful an attention to hygienic matters as is particularly necessitated at this period of increased metabolism.

Warts and moles are distinctly unsightly skin appendages, despite certain terms like "beauty spots," which merely mask the truth. The elimination of warts is simple: a splinter of wood or match dipped in pure nitric acid and pressed well in usually suffices with one application; if carbolic acid is used it requires several repetitions. An older method still was efficacious, though not pretty; it consisted in "strangling" the excrescence by a silken thread tied tightly round its site of attachment to the skin, and so left tied till withering occurred.

Moles require more careful attention, and should on no account be irritated by maltreatment; and if there are hairs rooted therein it is best to dispose of the hairs first by electrolysis and then to attack the mole itself by the same agency. Superfluous hairs anywhere are also best removed by electrolysis, which, if done by a skilful operator, causes neither pain nor scarring.

The "double chin," like its prettily-phrased neighbour "embonpoint," points to a want of exercise of the muscles

in the neighbourhood, and the diagnosis indicates the treatment; firm massage will remove the superfluous fat and generally fulfil the necessary conditions better than strapping, though this is not altogether ineffective. The existence of any such obesity of the face indicates, however, that the whole mode of life and diet requires examination.

Occasionally it is desired to remove a dusky discoloration of the skin of the neck or shoulders. Peroxide of hydrogen in a 5 or 10 per cent. watery solution allowed to remain in contact with the skin during the night is frequently sufficient to eliminate it at least temporarily, but here also it is well to consider more fundamental principles of life as they may have a bearing upon the question. A dead-white bleached colour is not to be compared with any actually healthy tinted skin and is worlds removed from the tawny fulvous shade or satiny sheen of the rightful blonde. It is not to be forgotten either that peroxide of hydrogen is a powerful bleaching agent and a destroyer of protoplasm, from the too frequent or careless use of which a skin may be considerably damaged.

In any application to the surface of the body for cleansing or any other purpose the chief fact to be borne in mind is that the sweat-excretion must not be interfered with; next to this it is important to remember that the surface of the keratinised cells and the downy hairs gently moistened and lubricated by body oils are to be maintained intact if hope is possessed of having a "natural" skin.

Attention to the lips will follow the usual lines, but there is a warning that must be given to smokers. The lip is a favourite site for a form of cancer, and the predisposing cause to such cancer is irritation. Such irritation may be supplied in the case of the cigarette smoker

by adhesion of the paper of the cigarette, necessitating a continual stripping of this, with possibly some of the membrane of the lip along with it. Pipe smokers must observe that there is no sharp edge on their favourite pipe for the same reason.

CHAPTER VIII

THE HAIR

The hard fate of the grey-haired—Other indications of unfitness much more trustworthy—Hair useless and dangerous as at present treated—Structure of hair—Temporary baldness—Causes and treatment of baldness.

Hats.—Compare with face—Head should be cool—Effects of hats—Various experiments—Hats are admirable bacterial incubators—The lesson of the pugaree—Follicles destroyed the hair cannot grow again.

Colour of Hair.—Greyiness means vacuoles—Metchnikoff and “chromophages”—Patent preparations—Metallic solutions the worst—Paraffin—The X-rays.

Washing the head—Military brushes—Machine brushing—Dandruff—Shampoo.

Women's Hair.—Washing—Hair-pads are dirty—Hairpins—Curling—“The Rape of the Lock”—The best way to wear hair—Looseness of dressing—“Chromophages” killed by a hot-iron—Also the hair—Combs condemned—Brush twice a day—Wash once in three weeks.

Facial Hair.—Moustache—Beards—Barber's itch—Various depilatories.

THE police courts, poor-houses, and rivers afford us doleful testimony of the importance that is ascribed in this age to the possession by men of hair from which the natural pigment has not departed, and from this absolutely inadequate testimony has arisen the sentence, which would be laughable were its import less terrible, of “too old at forty.” This is a preposterous saying based upon no physiological evidence, but welcomed as any other excuse would be by a generation which, inspired by transatlantic example, has chosen false gods.

Hair pigments whether black, brown, golden, red or any

other of the innumerable tintings that may be displayed by it, gives no indication of virility by its special colour, and shows little loss of such virility by its departure. Surely we are past the stage of those ancient personages who believed that strength lay in the hair! Baldness, curiously enough, does not seem to receive the condemnation, to the same extent, of employers of labour; and I have not yet heard that men have been refused situations on account of their abdominal protuberance, yet this latter indicates a sufficiently grave condition of malassimilation and fatty infiltration, which is pronouncedly pathological; nor have I heard of such employer testing the aspirants for work by examining the thickness of their arteries, which is perhaps the most valuable sign of all of a man's unfitness.

The truth is, that hair upon the head or the face of men is a vestige of a structure that has had important values in the past, but which—unless the No-hat League secures wider sway—is nearly useless, save for æsthetic purposes, in our climate in the present. Nature has her own way with such survival-structures, and greyness and baldness indicate the finger pressure by which she is gradually eliminating hair. Probably it is true that we become greyer earlier than used to be the case; probably also we are becoming balder; but the fact that these things prove nothing regarding fitness is very clear when we observe also that, in spite of whatever popular croakers, men are living longer.

This must be said, that there are two ways of regarding hair: from the one side it is an effete structure whose place has been taken by various articles of attire, with the result that bodily energy which has hitherto been diverted to the growing of hair, is thereby freed to attend to possibly more important bodily concerns, and every encouragement is thus afforded to this epithelial product to "silently steal away." On the other, there is the point of view which

declares that, as the hair is there, it is well to utilise it, and to nourish and encourage it in every possible way. The latter is undoubtedly the opinion which should have weight with the individual who is liable to depend for his work upon the pigment and condition of his hirsuteness: it is that, too, which will appeal to those in whom there is any æsthetic sense: on this side, therefore, will be the vast majority.

In this discussion will be ignored the fine downy hairs which are to be found in most parts of the body, and which differ considerably in structure from the more notable product of head and face. They are all derivatives of the epidermic layers of the skin; and, while what is good for the skin is also good for the hair, there will evidently require to be special measures applied to the latter, if the skin from which it springs is to be thoroughly healthy.

It is known to every one who has glanced over the advertising columns of a newspaper that the hair follicle in which the hair is imbedded and grows is situated upon a little elevation of the dermis—the hair papilla—and that here is the actively growing part with its consequent blood and nervous supply. Hope for the hair is not lost, no matter how complete the baldness, so long as the papilla and the follicle are intact. Such baldness that may be recovered from is that which occasionally follows fevers, or prolonged worry, and that curious form which occurs in patches, and is named “alopecia.” What it is precisely that happens in the latter, and indeed in any of these conditions, is still matter of dispute. It is possible that, from the general interference with vitality that occurs in debility, however induced, there is an inferior “ring” of hair produced at these times, a place in the hair, therefore, which will not be able to withstand the ordinary wear and tear, with a consequent breaking or dropping off at that point. Or again, while this may be a factor, the opportunity

of weakness thus given the bacilli which always inhabit a hair follicle or its neighbourhood may be sufficient for them to destroy the hair in their immediate vicinity—just as occurs at the “neck” of teeth—with the result again that it must drop. Whatever the active or immediate cause there are several factors which contribute to the loss; for it is very plain that the state of the blood or blood-vessels, the condition of the nerves, and the activity of any micro-organisms present might each or all of them produce the final effect. With a still active follicle the treatment necessary to restore the hair suggests itself: attend carefully to the cleansing of the skin; stimulate the blood supply by local applications such as capsicum, jaborandi, ammonia, or—one of the best—paraffin, and aid this stimulation by judicious rubbing, which should be done with the fingers; at the same time attend to the general system. The same applies to the falling out of hair, which occurs in practically every one who wears hats or headgear incessantly, and also in many who do not. As a curiosity may be noted a recipe for baldness dating from the time of King Chata: “A mixture of dogs’ paws, dates, and asses’ hoofs ground up and cooked in oil: rub the preparation vigorously into the head.”

The hat question is worthy of a separate paragraph. The face contains much more sensitive structures than the scalp, yet it is a fashion, which has led to but a minimum of harm, that the face should go quite unprotected by hair while the scalp is densely shrouded in it. This scalp-covering subserves principally the function of warmth, yet we ignore this and add to it the most unscientifically devised of heat incubators, many of which have to be pressed firmly on in order to maintain their position, and which by this pressure occlude the arteries which nourish the scalp and hair they are intended to protect. Be it noted too that such covering, particularly in

summer, infringes the fundamental injunction that the head shall be kept cool. It is a natural inference that the sex, or the members of it, which wears the closest-fitting headgear will suffer most as regards its hair, and the inference is borne out by the comparative immunity of women from baldness. We can hardly hope to see men clothed as to their head in the minutenesses of bonnets or suchlike feminine airiness, but that state of being hatless which these suggest is not unattainable by those who refuse to believe that the voice of the majority is a *vox dei*, particularly if they refuse to believe in the sanctity of a "parting."

There are, fortunately, at our service certain definite figures concerning the hotness of different varieties of men's headgear, which were obtained in the summer of 1906. One investigation was carried out in Paris by a doctor, wearing the ordinary top-hat with a thermometer inside it. He found in the early morning, with a shade temperature of 77° his thermometer registered 90°; at noon, with the outer air at 90°, the hat showed 108°; while in the evening, with a cool breeze and a temperature of 68°, the heat inside his hat was indicated by 88°. It is hardly astonishing to hear that he proposes to read a paper to the Academy of Medicine concerning the inevitable ill-effects of hat-wearing in summer. A shorter and less convincing series of experiments was also conducted by a writer in one of the English magazines: he used different hats for only, however, a quarter of an hour each, and found that, under as nearly as possible the same conditions, while a Panama gave a temperature of 78° the silk hat showed 89° and a motor cap 98°. The moral is evident in an overheated scalp with engorged vessels, retarded evaporation, and accumulated sweat and oily secretion. No more favourable incubator for "germs" could be supplied by a pathological laboratory, and to germs we are beginning to suspect much of baldness is due. Clearly the Panama is the most desirable of present

hats for heat, but there is a curious suggestiveness in the habit of Englishmen in India who wear a drooping white cloth or other fabric (a pugaree) attached to the back of their helmets: they realise that the back of the neck, where the spinal cord joins the brain, and where are situated the nervous centres essential to the conduct of life, is the most vulnerable place; yet for chief protection they wear this white flimsiness! Why not then a covering of similar material for the whole head? a covering which would permit of ventilation and sufficiently occlude the sun's rays.

Cold is the only other condition against which the head may require assistance, and the dry cold which the face can resist cannot—with proper training—prove dangerous to the scalp. It is, naturally, not suggested that a lifelong hat wearer should at once forego all covering for the head. Against rain only a shield to divert its passage from the head to the naked body is needed. Elsewhere are considered the value of light and ventilation as efficient servants in guarding the body.

For the preservation of the hair to the longest time and in the best condition it is essential that each individual should thoroughly consider the harmfulness of a custom which began with the need of protection from violence, was continued by a desire for distinction and ornamentation, which has developed a most unbeautiful series of coverings, and which has been proved over and over again to be deleterious to at least the hair. The effect of poisoning the vegetation of the scalp by the noxious vapours and materials engendered by hat wearing is quite comparable with the destruction of all plant life in the neighbourhood of a chemical factory. With the follicles, or hair roots gone, the case of the hair is of course quite hopeless, for we have not yet reached the stage at which these, like skin may be grafted on in sufficient areas to be useful.

The colour of hair is derived from the absorption of selected colours by special granules of fatty composition contained in the deeper layers of the bark or cortex and in the pith or medulla of the hair. The colour scheme is assisted by the distribution of vacuoles in the cells of these parts. Complete greyness means that all the fatty material has been absorbed, and that the vacuoles have correspondingly increased in number. Degrees and kinds of greyness are accounted for by the sheen of the hair, its coarseness or the thickness of its cortex, the amount of pigment still left and the innumerable possibilities of arrangement and reflecting powers of the vacuoles. Metchnikoff has investigated the question of greyness, and he states that it is due to the activity of certain devouring cells, named by him from their powers "chromophages." The function of these cells is probably not different, in other than their position, from that of kindred cells in every part of the body, which, when vital resistance falls too low, are capable of attacking the structures in which they lie. It is indeed one theory that in this phagocytic action we have the explanation of the encroachments of old age in all parts of the body, since the natural function of these cells is to dispose of devitalised and foreign materials. Why the pigment of hair should fall an early victim, save in those who have actually the "strongest" hair, will be readily perceived by any one who realises that in hats and worry the outposts of the body in the scalp are likely to receive least vital support.

However produced, the greyness is an economic, sometimes an æsthetic disadvantage, and is responsible for no mean part of that activity in which are engaged some forty thousand patent medicine makers and vendors in Great Britain alone. Their productions in this special department are variously named, and we are all familiar

with the Hair Restorers, Tatchos and Harlenes, &c. One would imagine possibly that a stain and a dye are very different things, but it will be well not to carry this expectation so far as belief in the commercial products of the cosmetic art. It may be assumed that the "stain" of the hairdresser in no way differs from his "dyes." I will settle one dispute at once as to the harmlessness of any such stain or dye. None is harmless (on this point I accept a statement made by one of the largest firms in England concerned with these products), but there are of course degrees of harmfulness, and the most undesirable of all hair dyes are those which depend for their action upon the metals, such as lead and silver. Vegetable colouration—as obtained, for example, from walnut-juice—is the best, and intermediate to these come sulphur and a host of others. Henna, it may be noted, is a plant product. There is no difficulty in deciding, then, as to the agent that should be employed in an unfortunate necessity. Dr. Hutchison, in his "Patent Foods and Patent Medicines," mentions the principal materials in several much-advertised applications for the hair. The article bearing the name of "Mrs. Allen's" contains acetate of lead and sulphur, as does the "Mexican Hair Restorer." Tatcho, in a different category altogether, is stated by him to depend for its action upon purified oil of paraffin, but it seems hardly necessary to buy paraffin in such a form. It has been said that paraffin is of value to the hair—whether by its antiseptic vapour, slight greasiness, &c., is immaterial—but ladies require to be particularly warned of the great danger of drying their hair before a fire after they have used it: there have been recorded already several fatal burning accidents.

Professor Imbert, of Montpellier, who has been working for ten years on investigations that necessitated the use of the X-rays, has recovered the pigment of his hair,

which had all completely disappeared twelve years ago, and he attributes the recovery to the X-rays. He is confirmed in this view by Professor Ullman, of Vienna. Unfortunately, however, this treatment, even if it proves efficacious when further tests are made, is hardly attainable by the class who are handicapped most severely by the loss of hair colouration.

Thorough washing of the head need not be done, in the case of men, more than once a week : in this is not included the cold splash which will accompany the use of the morning tub in those who take it. Wetting of the hair daily will necessitate the replacement of the natural oil by a little brilliantine or pure olive oil. The present fashion of wearing the hair so short is a natural sequence of the wearing of unnecessary hats and caps ; but this shortness, combined with the ridiculous hardness of the "military" brushes affected by men, results in a most harmful irritation of the scalp, which must act to the detriment of skin and hair, and the same applies to the machine brush, which is at best useless to a normal head. The vigorous scrubbing with a rough towel is a matutinal indulgence which only men possessed of a most vigorous growth of hair can afford to indulge in, and the same applies to a daily wetting accompanying the cold bath, since the natural oiliness of the hair cannot be removed with impunity. The stimulation afforded by soft brushing is, on the other hand, definitely beneficial. Hard brushing is no preventive of dandruff, but will merely aggravate the condition by undue destruction of the superficial skin cells which as noted are "dead" ; that dandruff is present at all indicates something amiss with the skin of the head. The scalp, like the skin elsewhere, secretes in the normal state that amount of oil which is necessary to keep it in good condition ; if there is any superfluity, it is, or ought to be, absorbed

by the superficial cells ; if so much remains that it solidifies and forms a dry or solid "scurf," the condition is one best named "seborrhœa," and treatment requires to be directed to the skin itself. The greasy state induced by chest-protectors on the skin of the breast is quite similar. "Dandruff," or "seborrhœa of the scalp," which is only a worse or more marked stage of the same defect, is responsible for much loss of hair, and also lies at the root of many skin affections of an eczematous nature. The best avoidance of it is by following the usual rules of health, wearing suitable headgear or none at all, keeping the scalp clean on the same lines as are indicated in the discussion of the skin, and by noting that the irritation of hard brushes can do no good. Of course, when hair is so thick or long in a man that the brush can by no chance impinge upon the uninjured scalp, there is less need for precaution. The dry shampoo with strong ammoniated solutions is excellent as an occasional stimulus, and the rubbing in of a little pure brilliantine, while it should be unnecessary, will do no harm if it is not allowed to reach the skin, which in a healthy individual does not require it and will have to dispose of it when present along with its own secretion. Singeing, supposed to prevent the hair from "bleeding," of course does nothing of the kind, since no such escape of fluid occurs : it is practically useless, save when you are in doubt of the barber's cleanliness and look upon the singe as a purification by fire ; as a method of levelling the hair and eliminating split and broken ends the hairdresser may have some justification for it.

Dandruff, though essentially pathological, is the natural accompaniment of the modern treatment of the hair and is best removed by a thorough weekly lathering with soap spirit till it has temporarily cleared, since this is all that can be expected unless the conditions that caused it have been altered.

In women the question is complicated by the detail of length only ; they do not appear to find it necessary to wash the scalp nearly so often as once a week, probably on account of the greater thickness to which the hair is encouraged to grow, and also because their coverings are not to be compared in hurtfulness with masculine gear. Brushing in their case must not be done with force, for evident reasons, and the minor matters of splitting and unevenness here assume importance. There is, however, nothing to add to ordinary hygienic principles. It may be noted as significant of the extent to which our civilisation has affected women's hair that the market for hair is not at all supplied from England. Dark-hued tresses come from the south of France, and the fairer tints from Germany and Austria chiefly, but even here it is exceptional that they should exceed thirty inches in length, and their value per lb. above eighteen inches rises in almost geometrical ratio for each inch. Transformations, wigs, and the other gentler synonyms indicate that even comparative hatlessness is insufficient to prevent in ladies what in men is bluntly termed baldness : it occurs, however, much less frequently and to a less extent in their case. Any of these "transformations," &c., too requires as great attention in regard to cleanliness as does the natural hair : hair-pads are dirty and septic in the extreme. Hairpins very evidently should be rounded at the point and not sharp—they also require cleaning or frequent renewal.

While, however, women benefit by their headgear, it must be admitted that they themselves do their best to neutralise the good effects by their insane crimpings and curlings, their forcible twistings impacted for eight or nine hours—the whole of their sleeping time in fact at least—and the "waving" and other effects, for the attainment of which hot irons must be impounded.

There would seem, indeed, to be less than the centuries between our own time and that when it was possible for Pope to write :

“Your locks in paper durance bound?
For this with torturing irons wreathed around?
For this with fillets strained your tender head?
And bravely bore the double loads of lead?”

That certainly is treatment which no living tissue is able to endure with impunity, and hair—it is apparently necessary to state explicitly—is a living tissue. In loose coiling by day, and the arrangements of hair which these permit, or better still in absolute freedom, with loose plaiting by night, lies the secret of the proper treatment of what may still be woman's glory ; modern conditions in towns do not permit of it waving loose to its full extent, though that is naturally the most healthy state. If the hair has not that becoming spirality of growth which produces curling, it is very much the best to leave well alone. This despite Metchnikoff's theory that ironing the hair with an ordinary flat-iron at a temperature of 140° is even of value by being destructive to the chromophages which cause greyness : it hardly sounds reasonable that only chromophages would suffer in these circumstances, and one is really tempted to be ribald over this theory when it is realised that the pigment is destroyed within the hair, and that this itself is damaged by overheating.

The comb is an instrument which the necessities of children's and other uncleanly heads will not allow us to abolish, but save for cleanliness it had better never be used : brushing, of which the comparative slowness is not to its disadvantage, will amply meet all other requirements. Pediculi and their kindred justify the retention of the small-toothed article ; any other is merely a toilet superfluity and actual danger : the healthy scalp

will not tolerate scraping by a bone, horn, ivory or other hard implement, and the tugging to which the comb tempts when kinks or knots are encountered cannot but result in the dragging out or breaking of some of the hair.

Cleanliness is a *sine qua non* in the case of the hair as well as in every other tissue of the body ; and emphasis may be laid upon the fact that this is the function of the brush. Like every other process which has this end in view, brushing is naturally called for every night and morning, and a hard brush is not to be used: this applies to both sexes. Evidently, all care will be stultified if the brush itself is not absolutely clean. Men, from the shortness of their hair which unduly exposes the scalp, as well as from the faultiness of their hats, will require to wash the head thoroughly once a week ; women, who have a more sensible habit in coverings and who wear their hair long, will find a three-weekly wash the utmost that is required. The water used ought to be soft, or at least boiled, and a comb is unnecessary. Various preparations are recommended to facilitate such washing, and the least harmful and possibly the best is a beaten up raw egg mixture, but none of these is essential, and superfatted soap is quite sufficient. Thorough drying of a woman's hair before she coils it or plaits it for bed is an evident precaution, if neuralgia, apart from any harm to the hair, is to be avoided.

Facial hair in the form of the moustache or whiskers may or may not be ornamental: it is not useful, and that of the moustache is peculiarly liable to food and other contamination—which would suggest the desirability of its removal. The waxed moustache, though possibly it was not designed with this end in view, nor even for the purpose which the lady in Kipling's "With any Amazement" found so laudable, has the advantage of removing these superfluous hairs from the area of eating

operations. The beard, though it is not usually grown for that purpose, will protect the important facial and inferior dental nerves, and also, to some extent, the throat and chest. Apart from this, possession of these appendages must be justified by extreme cleanliness, an attention which should not be grudged when the immense saving of time and temper with the lack of necessity to shave is considered.

It will depend upon personal predilection whether or not the immediately preceding fall into the category of superfluous hairs, and it is very certain that the man who shaves cannot hope to maintain the pristine softness of his facial skin nor the tints of youth. In passing it is worth mentioning that "barber's itch" or "rash" is a skin infection caused by specific micro-organisms due to dirty shaving implements. Other hairs there are, however, which are admittedly superfluous, the commonest being the hirsute junction between the eye-brows, and, in brunettes especially, an occasional incipient moustache. Superficial destruction of such encumbrances is of course of merely temporary avail, so that the destructive action of such pastes as sulphide of barium seldom satisfies, whereas the action of a drug like acetate of thallium, while it undoubtedly removes the hair in its entirety, is unfortunately not selective, and is quite liable to leave the unfortunate user devoid of every hair of the body. In electrolysis is a slow but an absolutely certain cure.

CHAPTER IX

THE TEETH

Two complete sets—Not a Greek gift like appendix—Putrefaction—Dyspepsia and lung contamination—Intra-uterine beginnings of dental trouble—The effect of the comforter on the development of teeth and jaws—Child's food must not be too hot—Teething should be painless—Lancing—Disadvantage—Ricky teeth—Attention must begin with the first teeth—Dental formulæ—Human teeth are omnivorous—Canines—Tusks

Enamel.—Beauty of hard materials—The function of enamel—Neck of tooth is the vulnerable point—Caution in picking the teeth—The action of bacilli—Tartar—Dentifrices examined—Tooth-brush—Buy tooth-powders in bulk.

See the Dentist once a month, or at least once a quarter.—Artificial dentures must be kept as religiously clean as natural teeth—Take them out at night—The arrangement of the "bite" of teeth—Tooth-drill—Diseases shown by teeth—Gumboils, toothache, &c.—The physiology of mastication—Bread at the beginning of a meal—More chewing requires less food—General oral cleansing is necessary for a sweet breath.

THE adage, "Nature red in tooth and claw," though controversial in some of its implications, is of value in indicating the importance of the part which has been played in the animal economy by the teeth. Nor is this importance yet overpassed, in spite of the numerous devices of civilisation to tempt us to ignore their uses : for while man no longer requires a mechanism of the strength and sharpness to tear food from the living animal, and as little demands the crunching ability of gorilla or ruminant, it is still necessary for him to observe that every creature

of his order receives from nature two complete and perfect sets of teeth, and that there is a meaning and an obligation attached to the gift. It is, on the face of it, hardly probable that this trouble, taken in a scheme which always makes for economy and the line of least resistance, is unnecessary, since, notwithstanding appendices and other vestiges, we have little reason to cultivate a Trojan distrust of presents. But in a sceptical generation which persists in examining the mouth of the giver, it is perhaps as well that in the diseases which follow neglect and misuse in this respect there is ample testimony of the necessity of looking well to our own. Dental caries is suggested by Dr. Savill as one of the most prolific causes of neurasthenia.

What occurs in the systems of those possessed of defective or carious teeth has been compared by one forceful medical writer to the process of sucking the matter continuously day and night from a suppurating sore of the arm, and the simile is hardly either too repulsive or too vigorous to describe what actually happens. Caries is a much more polite term than "rottenness" or "putrefaction," but it means nothing less. Thus in the existence of such a condition is explained that horrible fœtor of the breath which can only be compared with the emanations from faulty drains: it is an unfortunate compensation that the persons responsible for this infliction upon their neighbours are themselves protected from perceiving it.

Apart from the odour, the absorption of the toxins from billions of flourishing bacilli is hardly desirable, and will inevitably assist in that defective digestion from which, by reason of imperfect mastication, such people are also bound to suffer; in addition, air passing over this putrefying material and thence to the lungs must increase the tax upon the body.

Mr. Chance, one of the old school of thoughtful

surgeons, dated the beginnings of dental troubles as far back as intra-uterine life, but we have not sufficient data to enable us to follow him accurately in this, and are therefore compelled to begin our investigations with the epoch of ordinary birth, a period which is itself considerably in advance of the time at which the average parent begins to consider the child's teeth; though how necessary this is becomes clear when it is remembered that the commencement of them, no more than that of the child, can be referred to the world of outward appearances.

The earliest possible treatment of this question is enforced by an article to which reference has already been made—the comforter, the rôle of which as evil genius is veritably protean. But along with it must this time be included the teat of the ordinary feeding-bottle, whether of the tube or the scientific boat-shaped variety. The likeness between the comforter and teat is obvious to any one who has ever seen both, and their influence over the development of the teeth is equally similar and undesirable. For the reason of this malign effect of what after all are comparatively soft pieces of indiarubber it is necessary to consider the question of development.

In the new-born infant the bones of the palate and jaws are soft, flexible, and incompletely united, and are naturally extremely susceptible to pressure, whether from within or without; while in the gums or alveolar processes are the germs of those elements from which the future teeth are to be developed. In a perfectly normal child the first tooth, usually a lower incisor, appears about the sixth month; but, as the “cutting” is only the culmination of a lengthy development, it is evident why the teeth should be cared for before this event. In hand-fed children the first object to be put into the infant's mouth—if it is not a “dummy”—is the teat of its feeding-bottle, and this teat corresponds in neither size, shape, nor

resilience to the mamilla of the mother's breast ; nor is the method by which milk must be obtained from it similar. It is known to every doctor that the milk almost runs from the breast, and that the amount of suction required to stimulate its flow is exceedingly slight. On the other hand, the force required to draw milk through the teat of a progressively emptying bottle is very considerable, how considerable it is well worth testing by personal trial. It will be found that the force needed to empty an ordinary "feed" is quite sufficient to make the jaws of any adult ache. Consolation, when this fact has been observed in the past, has generally been proffered by an assurance that the infant is specially endowed with the faculty of suction. But this is not true. What is true is that the child has to suck or die.

A child at the breast can obtain its nourishment by a comparatively simple vertical movement of its lower jaw ; a child on the bottle has to pull vigorously with indrawn cheeks in most cases, and the extent of the vacuum so formed, with a correspondingly great external atmospheric pressure, is of commensurate degree. Without going too minutely into anatomical detail, and recollecting that the position of the tongue is also different in the artificial feeding, it is evident that there must be pressure upwards into the palate inside the mouth from the tongue and teat, which will tend to arch the palate, while the pressure of the air on the cheeks, transmitted to the upper jaw, will bend the alveolar processes towards the middle line, and so increase the deformity. That this is what must happen has been known for long enough, but Dr. Hedley is now able to show casts of all the stages of the process. The pressure upwards, too, in the middle line would naturally throw forward and otherwise alter the incisor teeth, and to this action is possibly due the opinion entertained, or at one time professed, by various Continental friends that

all Englishwomen had prominent jutting front teeth. Evidently these ladies had been hand-fed.

Need the explanation proceed further? Developing teeth will be irritated, unequally stimulated, and become consequently uneven, while the developing jaw will become deformed and cramped. *Si testamentum requiris, circumspecte.* What has been written of the teat applies verbatim, and from the respective times involved, *a fortiori* to the comforter. The remedy is obvious in default of a satisfactory working model of the human breast or of a readily flowing bottle: the child should be fed from spoon or pap-bowl till it is old enough to drink from a feeding-cup. It is perhaps worth noting also that the child's food should not be too hot. 100° F. is the proper temperature, though 120° F. is comfortable to an adult, but a temperature of this height might well cause catarrh in the delicate mucous membranes of an infant's mouth.

Teething should be as painless a procedure as the growth of the bones, but to such an extent has hand-feeding become common that it is hardly surprising to hear the opinion authoritatively expressed that pain and distress is practically a normal accompaniment. It is no more inevitable than are growing pains, which every one now knows to be rheumatic. The truth is that as a result of teat or comforter the gums of most of the unfortunate infants are in a condition of chronic inflammation, with the accompanying bacterial adventitia: the points at which teeth propose to emerge are situations of rapid absorptive and metabolic processes, and peculiarly open to bacterial invasion; the nidus is ready and favourable; the micro-organisms are on the spot, so naturally the expected happens.

There is nothing to controvert this statement in the relief obtained in bad cases by lancing the gum, any more than there is in that from the administration of grey powder

and doses of bromide, though the latter is usually by far the better mode of treatment. Lancing means the destruction of the delicate membrane of Nasmyth, which is busily engaged in rounding off the enamel of the crown ; and the disadvantage of any diminution in the amount of this enamel is obvious.

When, however, it comes to be a choice—as occasionally happens—between lancing and convulsions, then the former must naturally be adopted, but not before the alternative treatment just mentioned has been tried. Teething, let it be repeated, is not a pathological condition, and when at such time there is grave disturbance that is clear proof that the child is not as it ought to be.

As well as from the accompaniments of the eruption of the teeth, much information is to be obtained from the times at which this occurs, and it has come to be almost diagnostic of rickets when this is unduly delayed. I have seen the simple addition of cream to a child's food act almost miraculously in apparently suddenly releasing the teeth: cream or other oily substance is essential to the diet of every infant.

Having secured the emergence of the first set or milk teeth—which takes for its completion eighteen months or two years after the first incisor has appeared—these teeth must be attended to as carefully as the more permanent set which is to follow them. This attention should begin with the first tooth to appear, and consists at this age in wiping the tooth and mouth with a soft rag dipped in a solution of bicarbonate of soda, containing—as for the ears—a teaspoonful of the salt to a tumbler of warm water. Night and morning are the natural times for this cleansing as well as after meals, and just as in the case of the adult, the night is the more important. As soon as the child can understand its uses it should be educated in the manipulation of a tooth-brush.

Decay in the teeth of a child requires as prompt an attention as that which is usually *not* given to the permanent teeth. There is no excuse for allowing the child's existence to be embittered by the pangs of toothache, or its digestion and whole constitution to be endangered by the cause of it. The stopping of teeth is not only of advantage to those of riper years. The fact that the first teeth are deciduous has nothing to do with the importance of keeping them in proper condition till the last moment of their usefulness. Caries of these is hurtful to the second set, a fact which cannot require more than statement.

The dental formula of a child is 2-1-2, meaning that in the half of each jaw there are two incisors, one canine, and two molars: that for a complete permanent set is 2-1-2-3, where the first two molars are replaced by two bicuspid, and behind these are three molars. First of the permanent teeth to appear are the first true molars about the sixth year, and last are the third molars or wisdom teeth about the seventeenth or eighteenth year, though in many people these never form, frequently from want of room in the cramped and deformed jaw, though occasionally this absence is a family trait. Possession of a perfect set of permanent teeth is matter for comment among the whiter nations, and it is doubtful whether this set—so far as they should develop these—can be shown by 10 per cent. of school children. The mournful pride with which Sir William Turner was wont to exhibit the perfection of the dentition in an aboriginal skull in the museum at Edinburgh was a lesson and an epitome of this passing.

From the dental adult formula itself there is little to encourage the food-faddist of whatever ilk, since, though on the one hand it is that of the vegetarian anthropoid apes, on the other the actual structure of the teeth indicates their function to be omnivorous. It is to be noted that

the canines, popularly supposed to be characteristic of the carnivores, are almost as formidably developed in the gorilla as in the tiger. It may be of some interest to notice that the huge tusks of the elephant are derived from the upper middle incisors, or at least correspond to these, while those of the walrus replace the genuine canines.

It is one of those happy coincidences, which are so curiously common in Nature, that the extremely hard should also usually be peculiarly pleasing to the human eye, a truth of which the diamond, ruby, and other precious stones are striking proofs. But it is doubtful whether the beauties of any of these in the same position could vie with that æsthetic satisfaction to be derived from the regular whiteness of enamel, as this blends with the colour scheme—no matter what its fundamental tone may be—of the human face. This is not the only instance where the subsidiary æsthetic has come to preponderate, as an incentive to preservation, over the more substantial appeal of a mere utilitarianism. It seems, indeed, probable that the claims made on the score of appearance and beauty will be sufficient to maintain us as an order of tooth-bearers when, if actual health were the sole appellant, our teeth would be allowed to lapse into desuetude.

The enamel to which teeth owe their beauty is the only part which should be visible, but it need hardly be said that there goes much more to the formation of a tooth than this. Upon the enamel depends largely the life of any tooth, since by its stony hardness is protected the softer dentine or ivory upon which it is moulded, and deeper still the cavity of the tooth, with its sensitive and vascular tooth pulp. Enamel is thickest naturally at those places where most hardness is required, and thins off towards the neck of the tooth at the gum; at this neck also is thinnest the bony cement by means of which

fixation in the jaw is maintained, so that, very clearly, at the gum will be the most vulnerable part. At this point, too, cannot fail to be the greatest possibility of the attack of micro-organisms deposited by the food and from the air. Helping to protect the neck is a very delicate extension of the mucous membrane of the gum, and it is important therefore to preserve this membrane—a fact to be borne in mind by those who favour the use of the tooth-pick or waxed thread for clearing away any débris which has accumulated in the interspaces.

Enamel contains at the most 2 per cent. of organic material and itself cannot nourish bacteria, nor, by reason of its composition, is it replaceable. Organisms which settle upon it in tartar or food particles cannot attack it by actually feeding on its substance, but as a result of their activities acids are formed by which the lime salts comprising it are gradually removed, and the underlying dentine finally exposed. When this has been attained there is sufficient organic matter in dentine (nearly one quarter of its constitution) for it to form a quite satisfactory nidus, and caries accordingly goes on apace.

Here is warning sufficient to keep the teeth clear of both food and tartar. The latter consists of lime and other salts deposited from the food, with mucus and cells from the mouth and a considerable number of bacilli—the whole forming a firm and extremely obnoxious jelly. To it is due the almost stony formation which has occasionally to be scaled. While the enamel is intact the tooth is evidently safe, and to assist in preserving it the secretions of the mouth are alkaline and antagonistic to the lactic and other acids formed by bacilli. This gives reason and force to the regular employment of alkaline mouth washes and tooth-powders, though it would seem well to anticipate the need of such alkalinity by preventing the formation of the acids; and as this really means

inhibiting the activity of bacteria, antiseptics would seem to be primarily indicated. But as antiseptics amount to an admission that the hurtful entities are actually present, the most rational treatment of all is the prevention, so far as this may be done, of such presence, by cleaning the mouth and teeth every time after food has been taken, in addition to the matutinal and nocturnal attentions.

This leads us to the tooth-brush and dentifrices. People who take the trouble outlined above will rarely or never need any powerful tooth cleanser, and their needs will be fully met by ordinary soap. Not every one, however, can bear the lather of soap in his mouth, and it may be evaded by using any trustworthy preparation of powered chalk or pumice stone and soap powder, perfumed or flavoured with whatever is preferred. The soap, as the threat of a Trust has made clear to the public, is the mainstay of the most satisfactory tooth-powders ; it is immaterial what harder powder is used with it so long as this is not hard enough to scratch the enamel, though sufficiently abrasive to remove any food and other particles clinging to it. There can be no need to explain the action of soap in removing dirt, either internal or external.

Tooth-brushes need to be of good quality for that unpleasant deposit of bristles in the mouth to be avoided, but if this is seen to and the face of the brush made so that it may readily pass well in between the teeth this is all that requires to be said save as regards size. The best size is that of a child's brush, as can be understood at once by trying it and perceiving the ease with which this size can be made to reach and pass along between the back teeth and the cheek. It is worth remembering that tooth-powder should be used in ample quantity, and that the cheapest way of buying it is by the pound.

In spite of all the care lavished upon the teeth these will decay, though if a competent dentist be at once consulted

the harm may be minimised. Mouth-breathing during sleep, for example, means a constant reinforcement of the micro-organisms present in the mouth and around the teeth. From many reasons it is often only when the tooth is far gone that the dentist is consulted, and frequently because it has not been earlier perceived. The ideal course is to see your dentist once every three months as a routine and have the whole mouth carefully examined ; and this also in the case of the children from the time the first tooth arrives. Monthly visits would not be too frequent, but as the quarterly is not yet an institution in this country the less revolutionary period has been suggested. In England we are far behind Philadelphia, from which the idea first took practical shape and where it is now in full working order, or such cities as Dresden. It will presently be realised that in dentistry as well as in medicine and everything else prevention is better than cure, and that it is better to pay professional men to keep the community well than for putting it right.

At Strasburg a dental clinic has been opened at the University, to which school children are sent by their school teachers : each child is examined and the suggested treatment written on a card, which, if it brings this back on a stated day, will enable the child to obtain free treatment. The opportunity is taken to instruct each little one in the use of the tooth-brush—instruction which is followed up by the teacher ; while in the natural history class object lessons are given on the teeth. Demonstrations also are given by doctors to the teachers themselves.

The need to have teeth stopped is, however, likely to extend as far in front of us as it has endured in the past, and we know that they used gold far back in the ten thousand years of the era of Egyptian civilisation. The material of such stoppings, whether of gold or oxyphosphate of zinc or the cunning insertion of tiny bits of porcelain, is

the affair of the dentist and to him it must be left. They whose front teeth are false and who are desirous to ignore and cause to be ignored this knowledge, may be reminded that a gold stopping in an artificial tooth is calculated to deceive even the most sceptical and inquisitive.

It is better to keep one's own teeth than to let them require stopping ; it is better to have them stopped than to have them extracted, in the majority of cases anyhow. But there is an unavoidable number of cases in which false teeth have to be employed, and these teeth also have to be cared for. Any dentist will admit the value of a nightly removal of the teeth and the keeping of them in a slightly alkaline solution. Further, these dentures require as careful brushing as their natural predecessors. That thin edging of whiteness along plates consists of the same material as tartar and where there are any of the natural teeth remaining and in contact with this edge the "cutting" in of the plate upon them is not due to the sharp metal but to the solvent action of the acid-forming bacilli contained in the whiteness, or dirtiness, which would be the better name for it.

The necessity of giving the teeth something to bite against is recognised in the natural positions, for one upper tooth does not antagonise only one lower, but is placed so as to bite against the halves of the two. As a result of this when a tooth is lost, its homologue in the opposite jaw does not lose its usefulness, nor in addition, as when such usefulness of opposition is removed, will it consequently become loose and drop out. This dropping out is a definite tendency in teeth which are not sufficiently employed in actual biting, and in the meaning of this lies the value of giving them a proper amount of exercise in biting on hard materials. The toughness of the food of savages it is which not only keeps their teeth clean by the friction necessary to get through it, but which strengthens

them by the proper stimulation of their roots. See, therefore, that the children have occasional tooth-drill on such materials as apples, crisp or hard biscuits, radishes, and so forth, and see to it that the habit so acquired is maintained by the adult. Soft feeding is bad for the stamina of more than the individual as a whole. It is destructive to his teeth.

Such conditions that may be revealed by the shape and condition of teeth, as congenital syphilis, which is pictured in the upper incisors, or interruptions of health as shown by transverse furrows, are hardly germane to our intention. Nor are affections of the gums such as gumboils, alveolar abscesses, &c., any more likely to trouble the reader who makes it his business to keep his teeth clean. Tooth-ache is also a pathological entity, but this may be said of it that it is due to the undue stimulation of dental nerves, and that a decayed tooth is not necessarily always an aching one. Proper care of the teeth will attend to any caries, but when it exists the aching is frequently caused by acid fermentation, from which it arises that the old-fashioned method of treatment by loose plugging with soap was not always unsuccessful, on account of the alkalinity of the soap.

As explained already, even cleanliness is not sufficient. A complete treatment of the question of mastication is more properly associated with another part of this series; mastication and thorough insalivation is essential to all omnivora, and for this there is naturally required a complete equipment of teeth. It is quite true that saliva is secreted promptly in response to stimuli from the eyes, the nose, or the mouth, but the mechanical actions of the jaws in effective chewing have their definite value. The importance of mastication, apart altogether from the mechanical irritation that may be caused in a stomach by large hard masses, lies in the fact that the first half-hour of

digestion in the stomach is carried on by the ferments derived from the mouth. Here, then, is an important consideration—the teeth should be given their full share in assisting to promote such digestion, and they ought not to be insulted by the first food of a meal that is offered to them being of such a consistency or moistness that their province can be ignored. Dry bread; that must be chewed is the best beginning for a meal; best for the teeth and best because it provokes by its own properties the most active and efficient flow of saliva. The teeth as truly as any other part of the body must be properly exercised. In this the example of the late Mr. Gladstone, who devoted a certain number of bites to every mouthful of food, is worthy of a wider imitation. As a side issue, too, it is observed that much less food is consumed when careful chewing is enforced—nor, as we know, is this a disadvantage.

An approximation to the odour of "Cytherea's breath" is always desirable, though it is a curious truth that some very unpleasant diseases, like diabetes, may give the expired air a pleasant scent. In the hygiene of the mouth, chief place is given here to the teeth, but it is advisable to remember also that the former requires to be kept thoroughly clean; it is unfortunate to think that a vigorous orator, who is careless in respect to this part of his toilet, is filling the air in his vicinity with oral bacilli. The mouth and lips should be washed thoroughly after each meal to remove all adherent food particles, and they should be washed as carefully before every meal to remove all dust, &c., and so prevent the swallowing of unnecessary germs; while as long ago as the first century in the Sanscrit "Art of Life" washing the mouth was advised to accompany bathing as a preliminary to the day.

CHAPTER X

THE FEET AND HANDS

Spencer's query—The existence of an arch—Walking should utilise the pendulum-like swing caused by gravity, and the heel reach the ground first—The weight of the erect body should be transmitted through the heel.

Foot-wear.—The heel—Why not heel and sole on the same level?—The "American" shoe—Bunions—Trigger-toe—Second toe the longest—Ingrowing toe-nail—Chilblains—Chloride of calcium—"Nothing like leather."

Flatfoot.—Ligaments and tendons support the pedal arch—Muscular tone must be attended to—"Kipps"—Treatment—Why gout prefers the ball of the toe—How to measure boots—The value of plaster casts of the foot.

Keep the Feet Warm.—Sweaty feet—Detachable lining to boots—Cold bathing—Cold feet and disease—Blisters—Napoleon—Kipling—Alcohol—Soap—Corns—Callosities—Cancer—Gangrene—Ventilation of the feet—Boots illustrate once more the modern interference with muscular tone—For most of modern life shoes are ample—Fastenings—Turn the toes out in walking.

THE HANDS

Passive movement and number of joints tend to cold—Gloves should have a detachable, absorbent lining—Necessity of clean hands—In warm weather don't wear impenetrable coverings—Hot water—Astringent washes—Dusting powders—Freckles—The nails—Cleanliness—Spots and furrows in nails—Professional manicuring.

IN his autobiography Spencer mentions, among other questions which might with advantage be put to children by their teachers, with the view of inducing them to think, "What is the difference between walking

and running?" It is a question that might well exercise the minds of more than children, for it will be rather surprising to find the amount of information that may be self-extracted by its consideration. Apart from the length of the stride that is taken in each, and which is not a fundamental feature, since the action of running may readily be counterfeited and the progression made be actually nil, as in the pivot units in ranks at the double—the chief difference lies in the muscular agencies employed as well as in the part of the foot that first meets the ground, and in the fact that both feet are off the ground simultaneously in running.

In standing, both front and back of the sole of the foot are concerned in bearing the weight ; in ordinary walking the heel first receives the weight ; and in running the ball of the foot must sustain the early part of the strain. For the erect position of rest a plane surface would evidently be of as much value as the concavity of an arch, but the plane would clearly be less serviceable since less elastic in the various progressions, and if it existed would require muscular action to convert it into the elastic arch demanded by these. With the usual significant economy of nature, however, which throughout the human anatomy employs mechanical principles to save all unnecessary expenditure of energy, there has been evolved a supporting arch which can flatten, to some extent, when it is needed only for static purposes, but which is adaptable enough to take up and transmit strain in the form of the body weight without jarring, whether this develops from the front or behind. Normal walking, which ought to use to the full the pendulum-like swing of the lower limbs caused by gravity, will naturally make the heel the first place of ground contact, and it is the mechanical swinging movement of natural walking with which all faults in footwear as well as such artificial

training as the goose-step will first of all interfere. That walking which brings the front part of the foot earliest to the ground involves a greater muscular effort and is unnecessary.

The statement that in standing the weight is borne by both front and back pediments of the arch of the foot, where these touch the ground in the ball of the foot and the heel, requires modification. By far the greater support of the body in the erect posture is intended to originate at the foot of a vertical line dropped or rather raised from the heel, and the remainder of the human foot which forms the supporting arch has the function of a flying buttress, whose function is manifestly subsidiary, save in positions of relaxation or fatigue. The present ligamentous methods of maintaining positions (as is fully dealt with in "Position") have resulted, however, in the ball of the foot being called upon to take an undue share of the work, with the easily comprehensible sequelæ of a tendency to flatfootedness or obliteration of the pedal arch as well as to knock-knees and general limpness. There is much faithful dealing in the gibe at a weak-kneed generation.

To preserve the upright position and to have the weight supported mainly by the heels requires a well-braced muscular body: to utilise for this purpose the ball of the foot is not, of course, inconsistent with a bodily musculature in excess of even the former, but it connotes a greater strain than is intended or necessary upon a factor of the foot which makes for poise, elasticity, and activity, and which in disregarding a mechanical device at our service, must, to be efficient, be replaced by muscular action. This is a mistake which is increased by our irrational dependence upon tradesmen for our foot-wear.

The function of the heel in our present outdoor boots

and shoes requires quite a little consideration before it can be justified: it is readily understood where it may serve as a safeguard against slipping on treacherous soil, but why it should be necessary to raise the heel alone of all the foot an inch or more from the pavement of easily perambulated streets is not at once revealed. For, if the intention were to shield the foot from vicissitudes of mud or other climatic hardship, why is not the rest—and a much more susceptible rest—of the foot similarly guarded? This heel, too, has, till recently, been made of the hardest material, which while it ignores the possibilities of jarring, may be at least credited with recognising the region subjected to first and most wearing share in support. The reason would seem to be, that that far-off prehistoric genius who first gave shape to the boot with which we are still inflicted, while he succeeded in omitting many other essentials, yet perceived that there is an arch to the under surface of the foot, and decided that the easiest way of seeming to consider this, and at the same time to make some kind of an arching junction between the two portions of the foot which are still, as we know, catered for under the legend "soling and heeling," was to raise one end of it. I have no doubt that in the history of the coverings of the human foot there may be a different explanation of such genesis; there cannot, however, be one more satisfactory than that I have supplied for a most unconvincing piece of work.

It is at last perceived that low-heeled boots are the best, and it requires only a little courage to carry the argument to its logical conclusion, and to declare that the heel and the sole of a boot ought to be of the same depth; a step further with the realisation that the waist of the foot is the part which requires the buttressing of thickness, and no more would require to be done

for the underwear of the foot, if the sole is duly flexible. With each additional thickness added to the heel, the line of support of the body is thrown still more forward, and when this is actually complicated by the bringing of this heel nearer the toes, as in so many ladies' shoes, it is an antiquity of vanity hardly sufficiently punished by a compensatory disability in walking. We are most decidedly not intended for the mincing gait induced by walking on the toes.

The phenomenal length of the "American" shoe, in vogue not so long ago, was merely a clumsy attempt to adhere to a faultiness of design which has become an obsession with bootmakers. Instead of altering the shape, in order to allow of the necessary width at the widest parts, it was preferred to shoot forward the narrowness, and, while giving thus a little more space where it is needed, to maintain still the pointed appearance. There may yet arise another Teufelsdröckh to explain this mania for angularity and points; it may be perceived in flat-topped hats, pointed moustaches, pointed collars, "squared" shoulders and so on, but when it attacks the feet there is more than fashion concerned—there is actual health.

Probably the reader has fully realised all that is involved in the shape of a comparatively unyielding upper covering of the foot, but the importance of the matter justifies its recapitulation. If there is any mathematical figure to which must approach the shape of the inner edge of boot or shoe, it is that of the straight line, most emphatically not that of an angle with its apex at the side of the ball of the great toe. An angle in the other direction would do less harm, because the powerful tendons passing along the top of the foot would greatly nullify any attempt at such distortion. With the angle directed as it is in the

majority of boots, the deformity caused by this is actually increased by the tendons mentioned, and is consequently difficult to recover from, so that a bunion once well started is almost incurable, and bunions are among the commonest of the evils induced by pointed shoes. Where the narrowness across the toes is excessive, the foot may, in its desperate attempts to lessen its bulk, cause the great toe to become pushed under the second—a tendency which, if the boot is short as well as narrow, will result in the second toe doubling upon itself in an upward direction, with the formation of what is known as “hammer” or “trigger” toe. The longest part of a foot is on the line which connects heel and the tip of the second toe, so that the point of a shoe—if point there must be—would naturally fall on this line; and such point would gradually slope away towards the little toe, and possess no slope at all towards the other side, where is the big toe, of length practically equal to the second. Such minute description is, of course, supererogatory and may be summed in the statement that any foot-covering ought to follow the lines of the foot, and not those of a shoemaker’s last, unless made from each individual foot. A minor inconvenience definitely arising from too tight boots is the ingrowing toenail, whose origin is easily perceived and needs no subtle explanation by the special fashion in which the toenails are cut, though it is probably safest to cut the nail square across at the top and not to round it off at the angles. Corns can be accounted for by nothing else than badly fitting boots, so that one can by a little strength of mind, displayed towards one’s special responsible tradesman, eliminate this source of suffering.

Chilblains may be welcomed as almost the sole common foot defect which is not directly due to boots, and in even these they are not always negligible. It may be

admitted that faulty circulation, with imperfectly reacting skin and injudicious exposure to cold followed by attempts to neutralise the mischief by heating before the fire, are at the root of this mischief, and in these respects they resemble similar occurrences upon the hands. Where tight boots are partly responsible, these must, of course, be remedied; and in addition to the hygienic routine for the prevention or cure of the remaining factors, it is found that chloride of calcium in ten or fifteen grain doses three times a day, taken for not longer than two days at a time, has an almost specific effect.

If all the statements made at a recent Sanitary Conference at Bristol were correct, it is hardly surprising, however, if users of certain American leather were to suffer from more than chilblains in wet weather, since this was indicted as containing glucose and even Epsom salts, while one speaker traced rheumatic pains in more than one case to the use of woollen linings containing large proportions of magnesium chloride. The old saying that there is "nothing like leather" would seem to require some emendation to bring it in line with modern imitations.

There is a painful affection of the feet—but fortunately a rare one—which, resembling in its symptoms rheumatism, is, however, definitely caused by tightness; it is accounted for by the compression of the small digital nerves of the toes, and from its investigator is named "Morton's disease."

The last remaining condition induced by misuse of the feet, and which will be prevented if their hygiene is understood, is that of "flatfoot," and along with it a frequently accompanying state of rigid great toe or "Hallux Rigidus." Care of the supporting pedal arch has already been emphasised, but now may be observed more closely the penalty of omission. Bones with their

connecting ligaments, and special ligaments of great power crossing beneath its vault, have the chief share in formation of the arch, but this is also maintained in its position by the action of tendons derived from several powerful muscles of the leg. Defects, then, may readily arise from want of muscular tone as well as from ligamentous failure—a truth which carries its own lesson. The usual beginnings of failure arise from excessive straining of the ligaments, and this, it is readily seen, must arise when the weight of the whole body is continuously borne by the front of the arch. Standing with the weight mostly supported by the heel could scarcely ever bring it about. The temptation to such faulty standing will evidently arise in those whose occupation leads to fatigue while it is accompanied by the erect attitude. Mr. H. G. Wells has given the symptoms in his story of "Kipps," and it is easy to recall a score of occupations in which such straining must occur as well as in shop-assistants, though in this class it will probably diminish as they are able to utilise the concession lately made of seats behind their counters. I have seen the incipience of this painful affliction stopped by simply using thicker boots, with a correspondingly greater support to all parts of the foot; but in its later stages, while much may be done by cold bathing, stimulating liniments and tiptoe-exercises, there is frequently required a definite supporting arch in the boot: this may be made of cork, or a steel spring; or, with a shoemaker who knows his work, it can be quite well obtained by thickness of the leather forming the waist of the boot—at the sides as well as underneath. The rigid great toe readily arises from flatfoot, since in the latter the foot lengthens from behind forward, by the collapsing of the arch; the great toe is driven forward correspondingly, meets usually the rigid leather of a too short boot,

and, since it cannot double back as in hammer toe, the joint beneath the ball of the foot becomes pressed upon, irritated, and as a result finally ankylosed. The remedy is obvious, or rather its prevention. The occurrence of gout in this the most favoured of its positions may be explained by similar maltreatment of the great toe, though to a less degree.

From the investigations we have already made into this question of the feet, one fact at once disentangles itself, that all boots should be made to measure, and this measure not the totally fallacious one in common use. Of what avail is it for a man to note gravely the length of a foot from heel to tip of great toe (the wrong toe, be it noted), and to add to this the width of the foot at even three different points? That gives no indication of the thickness of the foot, and this varies as greatly as the length. The simplest, and in the long run the shortest course, as it is undoubtedly the best, is to take a plaster cast of each foot, not of one only, and upon such cast to build each pair of boots. This suggestion is original, but it is of course too simple to be singular to myself, and I have no doubt there are shops in which the principle is adopted. Such a cast, while it would eliminate a great deal of senseless shoemaking, would prevent a large amount of very real suffering—among those at least who are not ashamed of the shape of their feet as they are, no matter how far departing from a ridiculous canon. Also, it may be worth pointing out, these casts might be utilised for the purpose at present quite incompletely filled by those “boot-trees” which, themselves of no particular shape resembling feet, are yet supposed to keep the boot in the proper shape. Naturally when you have once got your satisfactory boots these require a little attention, such as an oily dressing in wet weather, keeping them away from the fire, and so on.

The importance of keeping the feet warm is a commonplace of medical as well as popular knowledge, but the method of it should be far removed from that kind of covering which has already been typified in the chest-protector, and which means the accumulation of all its secretions upon the surface of the skin. The result of a similar maltreatment in the case of the feet is at once made evident by "sweaty feet," of which the accompaniments require no further particularisation. The polite term for them is the medical one of "Hyperidrosis," or in a still more pronounced olfactory stage "Bromidrosis." Treatment of the actual conditions is carried out by bracing up the skin under stimulating and astringent applications, and by drenching the socks or stockings with absorbent powder. But there is no need, in the majority of cases, for matters to proceed to this stage. The bracing effects of daily cold water combined with the presence of a definitely absorbent material of inexpugnable texture next the skin is usually sufficient; in special cases absorbent powder must be added, together with a daily bath of some such substance as weak formalin. Such precaution as the foregoing once observed, the boot itself must be warm, and it would seem almost advisable that it should contain a detachable lining, which should be washed like the other bodily underclothing at least once a week. Faulty boots are a very common source of cold feet; and the dangers of cold feet are usually exemplified in the typical experiment with fowls, which, immune to the bacilli of anthrax and cholera in their ordinary condition, yet succumbed to these diseases after their feet had been stood in cold water. The parallel between this experiment and the catching of serious colds after wet feet requires no forcing.

Certain affections of the feet there are which are only

brought into being by prolonged walking or marching, and which can hardly with fairness be attributed to the boots; small in themselves, they were yet worthy of the attention of Napoleon, as evidenced by the famous saying attributed to him regarding the power of an army residing in its feet. Kipling, too, in his inimitable soldier tales, has called attention to them. Blistering may sound a small matter, but it is sufficient to incapacitate an otherwise able-bodied soldier, and, while it may not be altogether warded off, there are certain small precautions which may help to keep the feet going till the necessary hardening has occurred. The dictum regarding alcohol being of more use to the feet than the head well exemplifies this, for the astringent and hardening power of whisky on the skin is well-known. Soaping the socks and boots is another time-worn device, while powder applied to the threatened areas is also valuable. The latter is useful also to stave off some of the pain of corns. The difference between corns and callosities of the skin may be worth mention. In the latter there is an overgrowth of epithelium with special thickening of the horny layers; but in corns, while this also exists, there is in addition a growth downward at special points of the horny material, which invades the softer structures, and which, reaching nerves when pressed upon, causes the pain. Corns themselves, soft or hard, are caused by intermittent pressure and are best removed by treatment with a 10 per cent. solution of salicylic acid applied wet or painted on with collodion, and after one or more daily applications for the necessary softening to be accomplished, the work is consummated by the ordinary "cutting." Protection to a painful corn may well be afforded by the coating of absorbent powder mentioned or by a ring of soft felt with its orifice over the painful spot, to take off the irritating pressure of the

boots. Corns, it may be remarked, are not always to be regarded as merely unpleasant minutiae ; in those over middle age they are occasionally the starting-point of that form of cancer known as epithelioma, and even of senile gangrene in the elderly ; so that care in boot-fitting is not futile, if only on this account. Too tight a bootlace tied round the ankle has caused the loss of a foot to more than one unfortunate sleeper. The pressure which can produce a corn requires only a longer period of action to cause ulceration.

The ventilation of the feet is complicated by the prime necessity for attention to warmth, and on account of the universality of leather in some form for the formation of uppers ; the sandal, unfortunately, is not suited to the exigencies of the English climate, but if the idea be once accepted that leather is, after all, not a *sine qua non* for covering the feet, it should not be difficult to discover a material which can at the same time maintain warmth, throw off water, and yet allow of ventilation. An artifice of the nature of feathers or fur in the animal world would seem to be suggested, and there is little doubt that a suitable material would soon appear if the present unworthy and childish horror of wearing boots even a fractional part of an inch "too big" in actuality or appearance were to disappear. Shoes at present are preferable on the score of ventilation, and also in some instances for making the ankle depend upon its own capabilities, since the supporting influence of firmly laced boots is not necessary to most of us any more than are corsets for the back. The preponderance in the adoption of boots for even city wear in cases where the weather is not an important factor is one more instance of the neglect, to their damage, of the inherent capabilities of support possessed by the natural structures surrounding every joint ; in this case it is the ankle which must suffer.

Where strain must be excessive, as in mountaineering or skating, there is nothing to be said, or where protection against cold, wet, or such impedimenta as jungle or brushwood is required; but for most occupations and even games the ankle should be permitted to do its own work.

Footwear, then, it will be clear, is of some importance, and with it may be coupled the use of the human heel for the maximum of support, and a minimal dependence upon the ligaments. Muscular action, it has been said, is of value in maintaining the arch of the foot and the strength of the ankle, and to round off the subject may be recalled the dictum of Sir William Turner, that turning out of the toes is probably the most civilised position for walking. As fastener the bootlace is undoubtedly the neatest and least liable to cause trouble; the strap method is simpler still, but is usually less æsthetically commendable. Button boots, fastening as they do at the side and overlapping, are least likely to let water in.

The Hands

Beyond the ordinary hygienic necessities of warmth and cleanliness there is little to be said regarding the hands that has not already been considered in other chapters. As the special seat of delicate tactile impressions, the finger-tips will require particular attention in the way of warmth, since the speed of nerve impulses diminishes definitely when the nerves transmitting them are "cold," and the delicate muscles of the fingers and hand are correspondingly sluggish in their response in this condition.

The tendency to cold hands, while, as in the case of the feet, arising partly from their distance from the central supply of fully oxygenated blood, is due chiefly to special conditions in the hands themselves. One of

these suggests itself at once, viz., the exposure and amount of passive movement to which they are subjected; but a very definite contributory is the large amount of joint and bony areas which are included in the region of the hand. In such areas active metabolism is at a considerably lower level than, for example, in muscles, and so it arises that joints are to a large extent dependent for the maintenance of the proper temperature upon their surroundings. Here is one reason why joints are specially liable to chills and diseases, and also one refutation of that garb which would leave children with their knees bare. The commonest sequel of "joint-colds" is rheumatism, and the value of prevention of this infliction requires no forcing. Exercise, it should not be necessary to urge here, is the best corrective, with gloves as a natural accessory to obviate the effects of undue exposure.

Gloves designed for purposes of warmth should possess the internal absorptive layer which is elsewhere insisted upon as the healthiest contact for the skin. There are few people so fortunate that they can afford to discard a pair of gloves after a few days' wear, and most of us, I fancy, are influenced in their choice by the durability of these articles. That being so, there is no other way of ensuring even moderate cleanliness than by having a detachable washing lining. It will perhaps be suggested that there is no need to carry this likeness between feet and hands so far, since the glove is much less used, but there is the counterbalancing argument that cleanliness of the hands is of vastly more importance on account of their frequent contact with food and the mouth, with other hands, &c.

For warm weather the impervious hand-covering that is usually worn is undesirable in every way, for either ventilation, actual cleanliness, or comfort. Such material,

then, as leather or kid in its various forms, suède, reindeer, and so on, are naturally excluded, and the most sensible fabric will be of fine-meshed construction, which can now be made in silk or wool as much as in cotton. Ordinary impervious silk is only a degree less undesirable than kid.

It may be worth noting that for the unpleasantly clammy hands of hot weather hot water is more efficacious than cold, since the effect in contracting vessels is much more lasting with the former, a fact taken advantage of by the surgeon in restricting hæmorrhage; the after reaction from cold applications is their disadvantage. For actual hyperidrosis, astringent washes, such as a 2 per cent. solution of formalin, and bland dusting powder are occasionally needed.

Most effective drying of the hands after every washing is always to be insisted upon; harsh skin is likely to be the penalty in even warm weather, and in cold it is not to be forgotten that chapped hands and chilblains are no mean penalties for carelessness.

Freckles of the hands are as ready to occur as in any other unprotected part of the skin under the action of sunlight. These little pigmented spots are the natural attempt on the part of the skin to screen and prevent harm to underlying structures; their prevention will suggest itself as gloves or other means of shading. A hint may be taken from the colour of the freckles as to the tint of parasol that is most likely to be of use in shielding from the sun; and accordingly the brownish reds and yellows are found to be most valuable in this respect.

Cleanliness of the hands should have special reference, if to no other time, at least to meals, and in such cleanliness of course the nails must be most scrupulously included. The nail is formed of very much the same material as the hair, and is of as much value to the

fortune-teller who "reads" the hand. It has, however, long been known that severe illness can cause an interruption of the nail-growth which will appear upon it as a transverse furrow. Longitudinal grooving suggests a gouty or rheumatic diathesis, but the white opacities occasionally apparent are of the same nature as the greyness of hair, being due to vacuoles in the horny cells. Care of the nails is included, so far as it is necessary, in shortness and cleanliness, and remnants of the powder of the manicurist still adhering to a nail do not fulfil this condition. The much-desired lunula, the obvious manifestation of which counts for so much to the dilettante in such matters, indicates the growing part from which much of the nail is formed ; but share also is taken in growth in the direction of thickness and width by the nail folds, which should not therefore be unduly maltreated in the nail toilette. The average manicurist will do the nail more harm than good, since she is characterised by a supreme disregard for such minutiae of growth, while at its best manicure attends to merely the ornamental in shape and colour.

CHAPTER XI

LIGHT AND OZONE

Light.—Various conceptions—The spectrum—Light the source of energy from which we must not hide—Finsen's blue rays—Light is lethal as well as vital—Clayton's experiments—Browning's "Squander a Wavelet"—Flammarion showing the growth force of different coloured lights—Chemical rays causing sunburn, &c.—Sun baths—Effects of sun on a shum child—Platen's investigation upon the seeing animal—Wounded creep to darkness—Compare the wiriness of gutter children—Nordau on red rays—Absence of sunlight in towns evidence of Nature's one great mistake—Efficient fuel consumption—Windows—Frontage—Moonlight—Entangled light vibrations in the meshes of our cells are the source of our energy and must require renewal.

Ozone.—Ozone is of no actual value whatever—Tests for it are quite fallacious—Its presence at all is infinitesimal—And never in any case reaches the blood—May be of value in encouraging the taking of deep breaths—Or as an indication of absence of organic impurities.

THE fiery chariots of the ancient conception and the golden rose of dawn of the poet, and the ripples on a soundless sea, are ideas that have little in common ; but, while each has its own peculiar beauty, the last has the scientific fascination that it is true to the facts concerning light so far as we know them. It is the multitudinous laughter of the ether which gives us light and life. We are all children of the sun.

Wise old Sir Isaac Newton with reverential prism was the first to begin to understand the sources of our energy, and, as was entirely fitting, these were found to be beautiful with the beauty of the rainbow. It resembles that

high hill from which were visible all the kingdoms of the earth—this piece of crystal through which may be perceived all the glorious colour of a universe—for here is the blue of a summer sky or a turquoise sea, the blaze of the ruby and the sheen of an emerald, the rosy promise of the morning and the deeper glow which says “good-night.” May it not be permitted sometimes to the dealers in such marvels to stop and ponder their beauty? For here, too, we know is the veritable elixir of life by the action of which it is possible for us to say that we are.

But into the beginnings of energy it is not for this page to go; it is for us to understand that the mighty rhythm of that cradle which rocked us into life is still a-swing, and that while we have been permitted to gain some insight into its mysteries we have yet to prove by our lives that we deserve the initiation, a loyalty that will be best shown by not withdrawing from our source.

Finsen, a more truly noble Dane than Shakespeare's, picked out the blue from the spectrum; he sent it through his cooled and complex prisms to attack one of the foulest and most hateful diseases that ever gnawed the human front. That was the cure of lupus, the logical sequence of an observation that the germs of consumption were killed by sunlight in four minutes. This action of sunlight upon the micro-organism of lupus and phthisis is typical of what sunlight will do for humanity, if man himself will not interfere with its work.

There is here the curious paradox that while light is essential to life it has yet the power of taking away that which it gave. The apparent contradiction disappears, however, when it is recollected that it is a question of degree or intensity, so that what is good for man may quite well prove lethal to his bacillus. In the germicidal power of day is sufficient appeal to man that he should not shun the light; but that is only one aspect of the question.

The experiments of Clayton with beans grown in sunlight and in shade show with extraordinary force the effect upon not only the individual but upon posterity. The shaded beans and pods when gathered were less than a third of the weight of those grown with no protection from the sun. From the seed of these next year, the offspring of the shaded weighed only two-thirds of the others, notwithstanding that all were being grown in similar conditions and in sunlight. In the fourth year from the experiment the plants derived from the shady ancestry, though they produced flowers, failed to produce fruit—that is to say there was a failure to perpetuate, and, consequently, an extinction, caused by the deprivation of sunlight from the one generation. That is a lesson which is easily read. It is clearly not for nothing that we have been evolved to perceive just that one octave of colour to which health will best vibrate. There is force in the warning of Browning not to “squander a single wavelet.”

M. Flammarion enclosed plants of the same species, age, and size in separate boxes of blue, red, and ordinary glass and examined them at the end of three months. Those plants completely bathed in blue light had not grown at all; those in the ordinary glass subjected to simple daylight had grown very considerably, but the red box had suited its occupants so well that they had increased fifteen times. Ordinary daylight, of course, contains red, blue, and green rays, and the red, as shown, is very favourable to growth, but the blue in it, as suggested by the blue box, had retarded its action.

It should be stated that, though the spectrum obtained from sunlight by means of a crystal prism or in a rainbow contains practically an octave of colour, these may all be resolved into the primaries of red, blue, and green. The last perceptible violet tint of the spectrum represents a vibration speed of twice the number of the first visible red.

This is the only octave of the sun's rays that the human eye is trained to register, but it as little represents all the rays derived from the sun as the historical life of man represents the story of the world. Figures are dismal things, so that, beyond remembering that these rays travel at a pace that would take them more than seven times round the world in a second, and that the point from which they emerge is more than ninety millions of miles away from us, we shall not attempt to calculate the billions of these wavelets (of which we are not to squander one) which reach us in a single minute.

In the dark region beyond the violet lie the powerful chemical or actinic rays, and far beyond them still the wonderful X-rays which can turn our visual darkness into light, while in the depths below the red quiver the cause of heat and much more. With the unseen spectrum we are not now concerned, but with the effects produced upon the human welfare by the rays we know as light.

The blue and ultraviolet account for the most vigorous chemical action, as shown by freckles, sunburn, and the death of bacteria ; but the range of action of these is very superficial, being, in fact, confined to the skin, since they are not able to penetrate blood however near to the surface. The other rays, increasing in length towards the red end, are less potent but have a greater range, though even they cannot be proved to attain any great depth in the body. The fact remains, in spite of this somewhat disappointing statement, that complete sunbaths with the patients naked, and with due precautions as to exposure, such as are practised at Veldes in Austria, have been proved to be definitely beneficial.

Turn a slum child into the country for a day as the Fresh Air Fund, for instance, permits so beneficently, and at the end of the golden day the tinge of red on the sallow cheek is due to more than a mere sunburn or scientifically

phrased erythema. The child's blood is actually redder and there is more of it. That has been proved by the vicarious testimony of various unfortunate rabbits. So much the sun will do for anybody, and, as blood is the test as well as the power of the machine, the whole organism has benefited accordingly.

The investigations of Platen round fittingly the advantages of sunlight to the seeing, and prove its immense invigorating power to them. He found that young dogs with eyes shielded took up 16 per cent. less oxygen than when their eyes were free. As a converse to this, it is now clear why the instinct of the badly wounded is to creep away from the light, for, in addition to thus hiding from possible foes, the available store of energy is less rapidly reduced in the darkness, and life so prolonged to the uttermost; while, as a corollary, there may be here some explanation of the wiriness and puzzling tenacity of what life they possess in the infants and babes of the foulest and darkest slums, since the stimulant and store-exhausting energy of sunlight is rather towards death than life in the starving.

For practical purposes, then, it is immaterial whether sunshine kills the germs of, for instance, consumption as in the Veldes treatment, by penetrative action or by the stimulation it affords to the energy of the body through either the eyes or the blood. The fact of this value is what must be recognised. The immense gain in the sense of well-being caused by a proper amount of sunlight has been experienced by all, though for the most heartfelt description it is necessary to consult Arctic explorers who have been subjected to the months-long night of the far north. They describe the effect of the first view of the sun as a veritable resurrection, and to them the ancient sun-worshippers become more than intelligible.

On this matter of the energy-stimulating power of light

rays Nordau, in his "Degeneration," suggests that there is a peculiar compelling force in certain tints of red, and that the appeal in this colour is to certain primary instincts which have their outlet in violence—battle, murder, and sudden death, in fact. He instances as of this "dynamogenous" nature the red of the soldier's coat of a passing day, which incites the spectator towards the "glorious" idea of killing his neighbour; in the same connection is the peculiar effect of a red rag on a bull, the "seeing red" of men blind with rage, and the colour of blood itself, which, while it sickens those of one nervous temperament with horror, has a bestial influence in inspiring ferocity in others. Since, however, the light rays form the source of all our energy whether for good or evil, the reflex suggested by one particular colour is not so extraordinary—if it be admitted that it exist. Certainly at one time the response of bloodthirstiness had its uses, so there may be something in the suggestion.

The promoter of energy of all kinds, and the destroyer of forms of life inimical to man, it behoves us to see that we expose ourself in the greatest possible degree to such benign influence; and in our homes this means that there shall be the greatest possible window-space, and a lesser stultifying of it, when provided, by the use of so many window-blinds and curtains. Apart from the house, it means the getting out into the fresh air at every opportunity. There is sound science as well as common-sense in the advertising of certain up-to-date health resorts of the number of hours of sunshine available at these.

There is little need to press the point that in sunlight and fresh air lies the solution of much of that physical deterioration which we are combating. No electric baths or ozone baths will replace, at whatever expense, that which is at our call for nothing. Yet, as has been pointed out, the problem, so far as it is a problem, is

entirely man-created. Nature seems to have made her one great mistake in storing up the energy of bygone days of blinding sunshine in the coal seams of to-day, so that now by our coal fires and their resultant fogs the light of the past is actually able to obscure the light of the present—a vivid allegory as to which presents itself regarding the prater who babbles of the *tempora acta*. Mists we cannot as yet avoid; fogs, however, are preventible, and the natural query is, of course, why are they not prevented? The reply to this is precisely the reply to the same question concerned with the similar cause of consumption. It is due to man's folly.

The prevention of fogs which disgust the thinking, and which stifle, choke, and devitalise every one subjected to them, is principally a matter of efficient fuel consumption, and grates and furnaces to this end are quite attainable.

Fog and smoke, though they test the endurance of the town-dweller, are not, however, the worst of the self-created trouble. There are still rows of houses so built that the sun cannot reach the ground between them, houses with deficient window-area, and houses with the worst chosen frontage as regards the sun. In addition, many are compulsorily indoors during their work, who fail to realise that, if they may not see much of the sun, yet the rays of the moon and stars will do them no harm. The moon has as much concern with lunacy as it has with the weather, or as night air has with sickness. Those rays which are provided exist with a purpose, and it is needful for the body to hark back to primal influences as often as may be. There is much force in the fable of that Antæus who renewed his strength each time he touched the earth, and who could only be overcome by being held up from it. The cry of "back to the land" has some point, but there is more need to get back to the sun. The

arc light can cause sunburn, but it can never replace the sun.

Life is not electricity—not, at least, in the popular sense from which the conceptions of a Crookes are sufficiently far removed. It depends upon the harnessing of ethereal ripples which have swung through a course of millions of miles to an orbit where they sway within the millionths of an inch in the fundamental cells of the human body. It is not strange that there should be action and interaction between the crowding arrivals at the body from the sun and those already playing their part in the meshes of the body, for, like all energy, these require renewal. By the renewal of this energy is obtained the fuller bound of the pulse and a deepening hue of the blood, and on these are readily built a truer bodily welfare. It has been necessary to trace this through red and blue and green with some circumambience, but to the point from which we started we must once more return—we are children of the sun; and, while there is no effective worship possible to such moderns as ourselves, there is yet an effective punishment of those who fail to do the necessary honour.

Ozone Baths

There is a tendency among certain minds to imagine the beneficial results of sunlight and those of what they term "ozone" to be of the same class and of a similar importance. On account of this impression, and assisted by certain loose medical writing upon the subject, we find that ozone baths find their place at the more famous health resorts. The statement from which such baths derive their justification is that the ozone is the active agent in producing that health which best flourishes at the seaside, in the mountains and such other places, and the inference is promptly drawn that if a small quantity of a substance is good there must necessarily be more virtue in a greater

amount. Such reasoning, of course, is puerile but it affects the actions of a not inconsiderable class.

A little analogy may for once be useful : air is excellent as we obtain it in nature ; it is by no means excellent to inhale it at twice the atmospheric pressure—as any caisson worker or diver will assure you. Nor is it any advantage to have the oxygen, which forms one fifth of the atmosphere, in much greater quantity than this ; far less to be compelled to exist in pure oxygen, which is toxic. In the case of the air and the oxygen, however, it is known that they are both of value to the body. Ozone stands on a totally different basis, for it is not at all admitted that it is of the slightest direct service in any quantity whatever.

Various tests for the presence of this material have been carried out in towns ; all such experiments are full of fallacies and as likely to reveal peroxide of hydrogen. This may be better understood when it is realised that in those places where ozone is most abundant—if the word can be used to describe such paucity—only one-thirtieth of a grain of it is to be obtained from one hundred square yards of air. The comparison of this quantity with the amount of oxygen used by an adult man will make the fact more striking, since such a man requires five hundred grains of oxygen in an hour.

From the very quantity of it, it is evident that ozone can be of little use ; but, on account of its further property of possessing great oxidising power, it can never pass beyond the mucous surfaces of the lung tubes, and cavities, even should it reach them. The fact that ozone is in the air would, however, prove that there is little deleterious matter of organic nature and is of value to that extent. Ozone, if it has any power of affecting respiration at all, does so indirectly and in the same fashion as the pleasing odours of flowers. When either of these is present the stimulation of various nerves makes one desirous of inhaling the

cause of the stimuli more deeply, and, consequently, deeper breaths of air with its contained oxygen are occasioned. From this is the benefit, and one reason, at least, why a favourite site for sanatoria is in the vicinity of pine forests. It is interesting to observe that the Grassois, who make the chief part of the world's natural perfumes, have an average life of over seventy years.

What has been written refers, of course, to the healthy, and it is not forgotten that in the treatment of collapsed lungs, for instance, there may be value in breathing ordinary air under pressure, while in pneumonia a supply of pure oxygen has been supposed to do good. Ozone belongs to the class of neither of these, and is of no direct value to the organism.

CHAPTER XII

THE EYES

Relation between eyes and fitness very intimate—The eye registers many ailments with which it has apparently little concern—Carlyle as an eye "case"—"Dyspepsia"—De Quincey like Carlyle—"Sick headaches," moodiness, &c.—Statistics—L.C.C. and spectacles—A "disharmony" between man and his environments—Distant vision the intention—Close vision our modern need—The structure of the eye—This is an age of black and white at the closest possible range—Accommodation is unable to stand the strain—White paper condemned—Snow-blindness, museum headache, somnolence in church—Colour printing is no advantage—Exhausts one instead of all parts of the retina—Faulty artificial lighting—Change of occupation fails if the eyes are not rested—Value of billiard cloth—Tobacco blindness—Pathological eye symptoms of artists—The child's eyes—Pigment of eyes suggests colour of windows—Curtains—Time for testing eyes—At forty-five all eyes require investigation—Insomnia and hallucinations—Night walks—Minor accidents.

IF the eye notified its own ailments as readily as it indicates those of other systems with which it has apparently little practical concern, there would be no necessity for the length at which this part of the subject must be discussed. But the scientific appreciation of all that is involved and connected with eyesight is a matter of only the last few years, so that naturally as yet, except in certain grosser aspects, this makes no appeal to the public—hardly even to the general scientific world, since within a few months, books bearing the names of authorities have been written professing to deal with

the question of physical deficiency and deterioration, yet in which there is absolutely no reference to the eye. Yet there is no closer interdependence than that existing between modern fitness and the state of the eyesight.

Jaundice usually registers its presence by the typical yellow tint of the mucous membrane covering the under lid and the proximate part of the white of the eye. Anæmia may be readily read there. In Bright's disease frequently the first warning comes from the puffiness of the lids in the morning, and for centuries the pearly white or blue of the eye of the consumptive patient has been remarkable. These at a mere glance. And there are diseases in which the diagnosis may be dependent upon what is found after examination of the interior of the eye and retina by the ophthalmoscope. The discovery of chronic kidney trouble is often first made by the oculist, while the fiat as to such grave conditions as general paralysis, locomotor ataxia and general tuberculosis is sometimes obtainable only from what the eye reveals. That apoplexy, or opium and belladonna poisonings, may be shown in a mere glimpse of the pupils is a commonplace of popular and medical knowledge. The greatest curse of modern visual life, astigmatism, gives no external evidence of its presence, however, nor could one predict in the majority of cases that any given person from his appearance must be long or short-sighted. Yet these defects are of infinitely greater importance than a mere anæmia or jaundice, which is so carefully depicted.

If, then, the health of the body generally finds so accurate a reflex in the appearance of the eye and its surroundings, are we at liberty to assume the converse and to assert that the body will probably register eye changes? For if it does, then emphatically there must be greater attention paid to the eyes as a source of many previously untraced ailments.

According to Froude, Thomas Carlyle was attacked at the age of twenty-three with a dyspepsia which never completely left him, and which from the beginning took the form of "a rat gnawing at the pit of his stomach." Added to this and as a quite natural accompaniment he was cursed with intractable insomnia. The treatment ordered by "long hairy-eared jackasses," as in true Carlylean phrase he described his physicians, was variously mercury, the giving up of tobacco, salts, hogsheads of castor oil, and so forth. These, including even the water-cure, he tried most faithfully and proved quite useless. Yet in spite of so miserable and racked an existence Carlyle reached the age of eighty-five years, of which the last twenty were passed in comparative comfort.

Here is reason sufficient for a manner or manners which were, to say the least, not ingratiating, without our having to improvise suggestions in the direction of excessive smoking or tea-drinking. Froude's explanation of his hero's humours that Carlyle was Carlyle is a "bald and unconvincing narrative." Nor nowadays are we fully satisfied by the use of the term "dyspepsia." Enlightenment may be sought in a phrase used by himself at the age of forty-nine where he speaks of "above a hundred museum headaches," or again where going into society costs him "a shattered set of nerves and head set whirling for the next forty-eight hours." And most significant are the periods of benefit derived when reading was at a minimum and life chiefly devoted to exercise in the open air.

But poor Carlyle never diagnosed his own case, and sufferers in similar evil plight were De Quincey, whose sufferings were not caused by, but the cause of, his opium-taking; Huxley, who described his vertigo, malaise, and other symptoms as due to sea-sickness; Darwin and others. The real cause of the trouble in all of these was

eye-strain, and whoever doubts this should turn to a most fascinating little book by Dr. Gould entitled "Biographic Clinics."

It is possible that some may remain unconvinced by even Dr. Gould, but whether or not his analysis and deductions be accepted, certain facts will be gained the existence of which is at present largely ignored. Chief among these is the truth that straining of the eyes need not be directly evidenced to the sufferer by a pain in them. The commonest, in fact, of all the results of an uncared-for eyestrain is derangement of the digestion, with stomach and liver troubles. The writer knows to his cost that this is so, since for years he underwent intervals of torture from atrocious sick headaches, which cleared up completely when proper spectacles had been prescribed. The megrims, gouty headaches and so on are phrases memorialising the impedimenta of accurate knowledge in the past, and no competent physician will believe in a stomach origin for these till he has first excluded visual deficiencies.

The strivings, failures, and agonies of the Darwins, Brownings, and De Quinceys are at this moment being reduplicated in scores of households where a promising or bright child is being spurred beyond the capacity of its eyesight, with resultant "biliousness," moodiness, and lethargy, or with unaccountable outbursts of temper exacted from it by the strain. The proof of this lies in the success of the oculist or the removal of the books and the substitution of the outdoor life. It is not suggested that the eyes account for every case of "unfitness," but the part played by them in bringing this about is a very large one. For it will be maintained by no one that bad eyesight is other than a disadvantage and a trial, and the facts are before us as to the large proportion of the population that is so afflicted. As a predisposing agent in tending towards deterioration to quite as great an extent

as say the cigarette, a few statistics will perhaps prove that bad eyesight is quite worthy of a place.

At the meeting of the British Medical Association in Toronto, 1906, the following statements were made. Of six hundred thousand children examined in London, 10 per cent were found to have less than one-third of normal vision. In Germany Cohn finds that 22 per cent. of the lower classes are shortsighted or myopic, while 58 per cent. of the upper classes are similarly afflicted. To turn to a third country, it is found that while the same conditions exist generally throughout America, in one school alone in Philadelphia actually two-thirds of the children had defective vision.

How such deficiency must operate in reducing the working ability of any people need hardly be elaborated. A fact that should be again emphasised is the infrequency with which the defect is suspected by either the sufferer or his relatives. It has already been noted how, in a singularly acute intellect, an existence of eighty-five years was insufficient to direct attention to the primary defect. So here is valid argument for the great value of early school inspection of all children's eyes, so that all the aid available in glasses may be invoked at once, for the initial defect—in the majority of cases a simple one—may by neglect lead to irremediable deformity or, as they are termed, organic lesions of the eyes. The London County Council, a sufficiently maligned body, was yet alive enough to the importance of such preventive measures to take the opinion of counsel as to the legality of their supplying poor children with spectacles at the expense of the ratepayers. They were debarred from doing this, but an association has been formed and has taken up the work: the very poor are supplied free, and those who can afford to pay are charged tenpence and upwards by arrangement with leading opticians.

A word borrowed from Metchnikoff's "Nature of Man" best explains why the matter of eyesight has become, so suddenly it seems, a crucial one. There is in this particular respect a "disharmony" between man and his environment or, to phrase it more accurately, between the human eye and the work it is now called upon to perform. At no time a perfect seeing mechanism, but in truth at its best overladen with faults, the demand made upon the ocular mechanism by the very acute modern development of town life has proved too severe. Nature evolves in the thousands of years, and man has been a little too rapid for the old lady. That is the curt statement of an inexpugnable fact. Nature built an eye primarily for distant vision: man has required that this should immediately convert itself into one to be used almost exclusively for objects at a range of inches. Thence the disagreement and the increase of opticians and the need of them.

And when the structure of the human eye is investigated the wonder that nature has failed to respond to too arbitrary a demand becomes decidedly less. Two translucent solid bodies, the cornea and lens, with two transparent chambers filled with fluid or semi-fluid, constitute the media through which light must pass before the sensitive plate or retina is reached. Nine muscles with their effective nerves concern themselves with the direction and amount of the light which is to be admitted. An optic nerve takes up the message and by devious paths transmits this to both sides of the brain. Multiply this statement by two, since most of us are fortunately binocular, and we begin to understand that since failure in any single part will cause mischief there are here considerable possibilities. Add the necessary pigment for the iris and the elaborate additional precautions for guarding the eye—which exist in every one and any lapse in which

is liable to cause trouble—eyebrows, lashes, lids, glands, canals, and the complication begins almost to simulate confusion. Defect anywhere may evidently lead to chaos, such chaos that even three hundred and forty grains of opium daily may prove only a temporary alleviation.

But all this organisation is indubitably a response to function, and in the past history of man is the evidence of what this function has been. There is no need to indulge in rhetoric as to the necessities to which the vision of primeval man had to answer: the ready perception of friend or foe at a distance, with the ability to fight at close quarters—an aphorism that may serve to designate the human need to within historic times—and, more recently, an ever-increasing tendency to focus attention upon the near objects of manufacture, amusement, and commerce, till finally came the age of printing and, in our own day, the universal spread of the printed page, to which school-boards have made minute attention compulsory. This is, in short, an age of black and white at the shortest possible range. Hence the test of modern fitness for the struggle for existence is the ability to make the most use of black marks on a white ground, either by reading or writing them. The universality of schools is a development of only the last generation, and “education,” which in the last analysis is concerned with the deciphering of white and black at an average distance of eighteen inches, is the too severe task which has been set the people’s eyes. On still further examination two ultimate facts become apparent. The first has already been perceived—the short range at which vision is chiefly engaged; the second, that white paper must be an additional evil.

Of the various muscles concerned in the more minute movements of the eye machinery, one alone has to bear the strain of accommodation or focussing. It is by means

of this, the ciliary muscle, that the amount of convexity of the lens is altered so that the image transmitted may fall at different distances from its surface, or rather, it ensures that the image shall fall always at the same distance, on the retina, though the rays from the object gazed at be parallel, as in the case of a distant object, or widely divergent, as occurs when anything at hand is perceived. Certainly the muscle of accommodation is accompanied in its action by contractions and dilatations of the pupil, in order that such images may be the clearest possible by the cutting off or letting in of extra light, but by far the greatest part of the muscular work that has to be done in effecting clear vision is done by it. And upon it is thrown also the effort to correct any defects of the media through which the light reaches the back of the eye, by endeavours to adapt the shape of the lens to securing a regular retinal image. This is a muscle, then, which in the exigencies of our life is always in action through the waking hours, a statement which applies to no other muscle of the body—not excepting the heart. It cannot be maintained that incessant contraction of any muscle is good for either it, the sensitive nerves it contains, the brain which registers its incessant messages, or the organism possessing the brain. In the young human being, with all its tissues more plastic than those of the adult, and with greater irregularities of substance in even those parts which will be later practically homogeneous, it is clear that a constantly acting force is bound to cause deflections by the giving way of the unequally strong materials acted upon, so that the expectation that the eye of the young will not stand this treatment is a natural deduction—a deduction borne out by the facts given at Toronto.

The importance of the preceding factor will be immediately admitted, since muscular fatigue is understood

of every one, and though the muscle in this case is very tiny it is yet so interrelated with all the facts of our conscious existence by its connection with eyesight, and so with the whole of intellectual life, that the statement need only be made to be accepted. The stigma thrown upon ordinary white paper will, however, require some justification. It is not at all desired that printing should be performed in, say, red ink on a blue, green, or other coloured ground. For to this the same or similar objections would apply. What will be indicated is that white lettering on black is the ideal.

Snow-blindness is a condition universally admitted to exist, and is well known to be due to the incessant whiteness. Those who have suffered from it know the stuporose condition it helps to cause. There would seem little connection between this and the mesmeric state induced by gazing fixedly at one bright or glittering object like a silver butterfly, the dazedness of children who have pored over books too long, the semi-hypnotic state of the somnolent churchgoer whose eye has been battered by naked points of light since his entrance to the church, or theatre headache, museum headache, society headache, and a score of others. Yet the common factor is the same in all of these—*fatigue of the retina*, or dazzled eyes.

We have little need, in the year 1907, to repeat Sir Isaac Newton's experiment with ordinary white light and a crystal prism. It is known to every modern reader how the rainbow is constituted, and that white is a fusion of all the colours or certain selected complementaries. This is the point, that in every eye or retina except those of the colour-blind are chemicals that respond each to its own particular stimulus or colour, and that on receiving the message from these chemical points the brain says red, blue, or green as the case may

be. Gaze on red too long and the whole machine objects; the red receiver is fatigued, and on removing your gaze and receiving only white light, as in looking into the air, the green of the light becomes unduly prominent in the area fatigued by red and a green replica of the object may seem to visualise. It is not well, then, to fatigue any colour area. And the compromise unconsciously adopted by civilisation is, by forcing us all to gaze continually at white, to fatigue each colour receiving and interpreting area equally. Let any one look at this very page. The great bulk of it, if the printer has spaced it properly, is engaged in sending the message white; that part of it, much smaller, which sends no message at all—assuming that there is no glaze on the letters—is the salient part which I hope it concerns the reader to follow. A curious reversal, surely, of what one would expect. It would seem more natural that the part sending messages should be the part to be translated.

And there is another feature in this “all-black” argument. Whoever has attended an international Rugby match has noted that Englishmen of the same size look larger than their Scotch opponents. This is on account of their white jerseys, for white does not give a definite clear-cut image, because the chemical energy liberated by it in the retina overflows its borders, so that round the more pronounced white image runs a more diffuse white margin. This is against precision and is assisted by defects in the eye itself, as is shown by the rays round stars, instead of these appearing as single points, or in the phenomenon of the “old moon in the new moon’s arms” according to Kepler.

White paper, like the gilding round pictures, is an unnecessary and persistent source of fatigue, but, unlike the gilt frame, there is no means of ignoring it, since

by its stimulation alone is reading made possible. Here then is something for the twentieth century to do, the supplying of a rational print and paper. Clearly a monotonous colour printing would act equally in fatiguing the eye by overusing the cells concerned with the particular colour chosen. White must participate in the future book and paper, since it overworks no particular colour perception, and black, which rests them all, is the natural background. Be it noted that the black ground would be to some extent encroached upon by the white letters, so far as seeing is concerned, and such letters would, therefore, require wider spacing for the same visual acuity, since this is measured by the space between letters or characters.

To the folly of straining the ciliary muscle and that of using white paper may be added all the various foolish appliances of civilisation whereby direct light is sent into the eye, or its almost equally harmful complete reflection. The naked lights of churches, whether taper, candle, gas, or electricity, have been mentioned. Theatres are equally guilty, as indeed are also practically all the homes in the kingdom. All light should be diffuse—a truth which condemns nearly every system of lighting in this country, as well as the atrocious glare of schemes of mirror decoration in restaurants and elsewhere. Add to this faulty artificial lighting the glitter of jewels, orders, table crystal and silver, and the society headache becomes more explicable—especially in the case of those silly women who dilate their pupils with belladonna, and thus cut off the screening effect of the coloured iris, and by admitting a continuous flood of light to the eye irritate their brain till it has recourse to chloral, &c., for procuring rest and sleep. The albino is not usually considered desirable of imitation, yet it is the eye defect of the albino to which these women approximate by using belladonna.

Every spot of bright light impinging on the retina is a cause of unfair fatigue, which is recognised in our schoolrooms by arranging the desks so that the light shall fall from behind and over the left shoulder. Change of occupation which, as a holiday almost, has been unduly lauded, fails most often in the desired result, because it has not been sufficiently recognised that unless with this change there is also a change in the eye stimulation the most prolific cause of brain irritation and fatigue still persists. Frequent movements of the eye afford relief, not only by bringing into play fresh parts of the field of vision, but by distributing the soothing fluid concerned in regulating its external surface-temperature as well as by facilitating its circulation. The value of restful colour schemes is now being perceived and acted upon in the home as well as in the country. The tint of a billiard table is not the least of its advantages. From one book to another is a very moderate relief; from a book to the garden or country is admirable, wherein lies that gain which makes golf the healthiest of pastimes, cricket being the less excellent for fatigued eyes, as it demands more time of the eye to be spent on the ball.

And here, perhaps, is a not inappropriate place to consider the effect of smoking upon the eyesight.

Medical men are well aware that there is such a thing as tobacco blindness, and that it is due to a gradually accumulating influence by the heaping up in the body of the products from tobacco; also that the retina and optic nerve are the seat of the mischief, which is, however, in the majority of cases, a quite curable condition and requires merely the cessation of smoking. Such blindness is rare and due to careless excess, usually in the heavier brands. To such a stage the ordinary smoker not only never approximates, but he is hardly even

affected in the way of impaired vision. It is not with this aspect of the controversy that I wish to deal, but with the soothing influence that is asserted to exist in nicotine by its votaries. Let the word "nicotine" stand, though the amount of this that reaches the system of any sensible smoker is infinitesimal. The aspect of smoking that is here of interest is connected with the fact that smoking in complete darkness is unsatisfactory. Now, if this is correct—and most smokers will admit it—there must be something apart from the mere inhaling of an aromatic smoke that is responsible for the benefits claimed. These would seem to depend upon the actual visual perceptions of the clouds of smoke themselves. The dreamy look of the contented smoker is notorious. The smoke acts as a rhythmically recurring shield from other harsher eye stimulation: its rhythm of occurrence is sedative, it soothes by its own colour as well as by cutting off other sensations, and as it is never directly focussed at its point of emergence, which would be too near the eye for comfortable vision, and is seldom, in fact, directly coned save in a lazy, inattentive fashion, it rests the eyes further by relaxing accommodation. If it be urged that the rest secured to the retina by such intervals is negligible, let the fact be recollected that the winking of the lids which accompanies any use of the eyes also occupies very little time but is an invaluable device for naturally resting them, as is well proved by the fate of those unfortunates who have been tortured by cutting the eyelids off.

It may be thought that this suggestion of the value of smoking is rather far fetched, but the various provisions for preventing direct sunlight from impinging on the dioptric media, the surrounding bones, brows, lids, and lashes, though effectual while a man's work is engaged with distant vision, are quite incapable of shielding from

the multiform sources of artificial light, so that any device which helps to this end is not to be despised.

The pathological interest unwittingly displayed in the work of artists has long been noted by medical men. Dr. Huber, in his book on "Consumption and Civilisation," has suggested that Chopin reflected in his later compositions the tuberculosis from which he suffered for the last ten years of his life, and that in the latest German school of sculpture there are symptoms of a similar condition; while in the "Venus" of Botticelli, according to Huber, there are most marked indications of this tendency to portray disease. Another physician suggests that Whistler's "Miss Alexander" is the picture of a child suffering from heart disease. Sir Lauder Brunton remarks that the curious zigzags so noticeable in the arrangement of his multitudes of people by Gustave Doré have a striking resemblance to the "fortification figures" or forked flashes of light seen in the headache of migraine. The preceding peculiarities of colour are readily explicable by defects in colour vision, and Brunton again remarks that defective eyesight, such as that of presbyopia or hypermetropia, when over-compensated by the use of too strong spectacles, may very well account for the vagaries of our own "Impressionists," since in such conditions there is a natural exaggeration of the colour perceived and a corresponding deficiency in the sense of outline, a criticism which, while it may not be pleasing to the *amour propre* of the school concerned, may yet serve to secure for it a sympathy which much of their work would, on other grounds, fail to excite.

And now for the practical application of all that has been said. It is seldom that the eyes of the new-born child require more than simple washing with a weak antiseptic like dilute boracic solution, though in Germany it is a routine to instil protargol, argyrol, or some similar

preparation. This is merely as a precaution that the child may start life with no actual disease of the lids or eye. Disease, however, is not our present consideration, so that beyond ensuring that a child's eyes are kept as clean as any other part of its body, this needs no further discussion. It must have been noticed by every mother that every baby's eyes are at first blue, a different blue, however, from that of later life, which is due to pigment and not, as in the baby, to peculiarities of reflection and refraction. On account of this lack of pigment the baby needs special shielding from strong irritating light, which in its case will reach the retina not only through the pupil but also through the untinted iris.

In a few months the typical pigment begins to appear and adumbrates the future colour of the eye, at first in coloured specks, which multiply, fuse, and finally form the more or less uniform iris. In this tint of the iris lies the suggestion for those colours of bedhangings or window-curtains which are best adapted to soften the light for any particular child, and it cannot be far wrong to imitate this tint as closely as possible. That is if it is believed that nature knows her business.

The time at which the ordinary child should be first tested by the oculist is the age at which it is normal for it to begin to notice and distinguish between its parents or caretakers, for though this is much too early an age for spectacles, it is not too early for the adoption of the resources lying in simple shading, physostigmine, or atropine, &c., should these be adjudged advisable, since assistance in contracting or dilating a pupil may be decidedly valuable. Whether this be seen to or not, there is one age at which a complete and competent examination of the eyesight should never be neglected, and that is when the child is first sent to school, whether in its own nursery, kindergarten, or elsewhere.

This is not the place to discuss the meaning of education or the means employed, but it may be said very decidedly that seven is the age at which a child may begin to learn its letters, and not before. Seven, then, is emphatically the date for a thorough investigation, and five if the present usual unfortunate beginning be made with school life.

On account of the differences in the eyes at this age compared with those of the adult, and also on account of differences in growth and texture, the investigation should thereafter be made thoroughly at least every year. The difference from year to year in a defective eye is very frequently worth correcting, whether of short or long sight, or astigmatism, where the fault is an inequality of the power of different planes of the eye. And unless there is actual pain or burning in the eyes themselves there will be no suggestion, possibly not even headache, to direct attention to the source of a child's troubles.

Puberty is a time when the usual precautions should be redoubled, and the same may be stated of early adolescence, and also of the climacteric, which is not a feminine monopoly. If any individual after the age of forty or forty-five prides himself on never having needed spectacles, and now as little as ever, let him not imagine his eyesight is normal; it is not. Every one at the age referred to should begin to need convex lenses for reading, and this need should ascend in a steady progression represented, each five years, by the rough arithmetical succession, 1, 2, 3, &c., for the first decade or so at any rate. The eye of the infant is much more convex than that of later life, and this loss of convexity of the lens is progressive, while translucency also diminishes, till at forty-five assistance in producing the convexity required for reading and other close work is a physiological necessity.

In addition to not despising a yearly ocular investigation, and the possibly suggested aid of spectacles, it need hardly be added that reading till the production of headache or other vaguer symptoms recognisable only by their synchronicity with prolonged use of the eyes, must be avoided. It is to be attended to that no reading is done in the face of the source of light, and that this light when properly used shall come from behind or be, while good, so diffuse that its source cannot be noticed. This is a condition which excludes most artificial illumination, and which further emphasises the value of the trite axiom, "early to bed and early to rise."

What will happen in the case of at least one hundred millions of the earth's inhabitants if these simple precautions are neglected has been adumbrated; and it may be added, as has already been considered under "Sleep," that there is no more prolific cause of insomnia, hallucinations, Psychical Research visions, and instability of brain than the misuse of the eyes. The night walks of so many brain workers work good from more than the mere walking, for accommodation is at a minimum in the dark, and the eyes are at a position of rest while the body is for once doing work without their active co-operation, and in dim light only those cells of the retina which mediate a blueish-gray impulse are involved; the rods and cones which are concerned with all bright light and definite colours remain unstimulated: the importance of this is obvious, since the cones are the sources of retinal fatigue. The lesson is to rest your ciliary muscle as you would rest your heart. Tennyson had more than the usual poetic insight, when in the reaction of eye strain he said:

"Leap the rainbows of the brooks,
Not with blinded eyesight poring over miserable books."

The minor evils that may assail the eyes, like particles

of grit, dust or metal, make it a desirable accomplishment to be able to evert the upper lid, since such objects are most usually found clinging to its under surface. This choice of lids is due to the fact that in the natural action of winking it is the upper lid which is concerned, whereas in winking of *malice prepense* the lower lid ascends; so that in the reflex movement which follows on any irritation of the eye the upper lid at once descends and usually sweeps off the offending particle, though it frequently then fails to dispose of it in the increased lachrymal current which is at once provoked. Where the irritation from any such cause is very intense and there is no one competent enough to clear the lid, it is always worth remembering that a single drop of castor oil will give considerable relief. For lime, alkali, or in fact any caustic which has reached the eye, this oil should be immediately used, or in its absence ordinary olive oil, till proper attention can be had.

Workmen are many of them extraordinarily expert in removing "fire" from the eye with a penknife, but for those who have not nerve for this proceeding, it may be remembered that the quaint method practised by our grandmothers of getting a friend to lick the surface of the eye is occasionally efficacious and is absolutely painless. It is needless to add, however, that one should know intimately the owner of the useful tongue.

CHAPTER XIII

THE EARS

The first sound given out by living organisms was probably threatening in character—Man's faculty of vicious circles—Results of noises of civilisation—Sources of noises—Growth of infants retarded—Deaf or mad—Noise, drink, and morphia compared—Ear-lids necessary—The whole mechanism of hearing—The stapedius muscle compared with the muscle of accommodation of the eye—Insomnia—Supernatural messages—The middle ear and Eustachian tube—Catarrh and deafness—Blowing the nose—Throat, nose, and ear relations—Wax in ear—Quacks—Coughing in church—Schools and noise—Deafness a deprivation of rhythm—Music—Acoustic indecencies—Practical suggestions.

Equilibration.—Semicircular canals—Affected by dancing—Connection with balancing—Vertigo by loud sounds—Hearing and equilibration connected.

THERE is little reason to doubt that the first conversion of molecular vibrations by the living organism into those forms of contractile energising which threw the outer air into responsive movement and caused a noise, were evoked in response to a need of protection. For it is true that self-preservation is *the* first law of living nature, while perpetuation of its kind can only come second. We have ample reason, then, to believe that the sound of threatening was heard upon the earth far in advance of the vocalisation of invitation or friendship: and if along with the foregoing law we are prepared to accept the doctrine of the survival of the fittest, it is easy to understand why the living entity with ability to

threaten should thus possess a first line of defence, and be speedily marked out as among the fittest.

Where this first menacing murmur originated we do not know nor can we ever know, unless one day it is ascertained whether or not there is an aura of speech surrounding the *amœba* or the *bacillus*. But there is little difficulty in understanding the rattle of the rattlesnake, or the roar of the tiger as it leaps. Nor is much imagination needed to trace the first vibrations of threatening in the stern hymn of the Covenanters, the blare of the bands in a past era of warfare, the skirl of the bagpipes: or similarly in the declamation of the Homeric heroes before they fought, or now on the mimic battlefields of athleticism in the weird cries of New Zealanders, South Africans, or any American college team.

To respond to the mere crudities of menace a very primitive mechanism would have sufficed, and possibly in the first instance these vibrations were recorded by a very widely distributed sensitive apparatus, since all that was required was a form of cell that could be affected by an agitation of the air of a certain intensity. It is quite permissible to assume that the reply of the skin to cold anywhere on its surface is parallel to the far-off "hearing" abilities of remote living creatures. But as from the language of the warfare of existence there evolved the ability to produce the tones of a gentler life, so there gradually developed the powers to register and understand these, till finally became differentiated the human ear with a lesser power of noting intensities but an extraordinary ability to analyse complexes of sound, with, as always accompanies great specialisation of function, a greatly reduced area of the body where such function is active.

Unfortunately man appears to be gifted with a certain kind of diabolic faculty which leads him to weave perverted circles through the æons of time. The power of

hearing, acquired to enable the living world to understand the threatening roar of winds or waters or living foes, developed through millions of years to become an organ to grasp the meaning of harmony, musical, human, and universal, has finally in our time become one more of the sources of weakness afflicting humanity on account of the menace and paralysing effect of the sounds and noises evoked by man and to which man is forced to listen. Little wonder that a doctrine of original sin arose, or that it was credited and has still to be fought.

As a result of the distracting sounds of civilisation it is certain that attention is more difficult to concentrate, that the brain in consequence cannot but suffer, insomnia naturally following, and as a direct result that insanity is thus increased. That one would expect, and expectation is more than confirmed by the facts. Dr. Hyslop states that in early insanity auditory perversions are the most common, the first to appear and the longest to persist : which is an amply clear indication that the areas of greatest weakness in these unfortunate brains are the areas concerned with registering and understanding, as well as remembering, sounds and speech. Bismarck, who was a martyr to insomnia, found the city noises soothing after a sleepless night : this is, however, a rare and somewhat dubious compliment.

It is not possible even to enumerate the sources of noise which may do harm. The mind of every one, of course, leaps at once to the motor-car or motor-bicycle with its maddening hoot or Maxim rattle of explosions : and apart from the mere irritation of the cacophony due to these there is the further fact to be remembered that the sudden bray of a swift-running vehicle is a momentary distracter of attention, with the not infrequent result that the death so meant to be avoided is actually

caused by the temporary bewilderment and hesitation induced in a sensitive organism.

But the motor-car is only one, though a deadly one, of a myriad. The whole of the street traffic in most provincial towns is a weariness to the brain: the buzz and rush of electric cars, the clatter of that anachronism the horse, and its burden, over unscientifically and barbarously paved streets; the yelp of the newsboy, verily as "wild as the scream of the curlew"; the ridiculous yapping and barking of dogs; the raucous voices, made more raucous, of city-dwellers who have to make themselves heard; whistles and bells, and such bells—trams, carts, ragmen, and churches! Is there any reason for the deadly inhuman clamour of those bells which are destined to remind us of eternity, and which have hurled so many a tired soul prematurely into it? Piano-organs! They are actually sometimes a *relief*, and no confession which praises them could more utterly damn the alternative by which in their default the ear must be overborne. As for railways, a strong protest against their methods of whistling and exhausting steam was made by the British Medical Association so long ago as 1890.

If mere insanity will not compel attention to the need of relief from the turbulence of town air, there is yet another fact to appeal to—the actual health and life of the children. The growth of infants has actually been retarded by the noisy streets in which they lived, of which the proof has been obtained by removing them to quieter neighbourhoods.

There is little wonder, then, that since overuse of any part of the body leads to its inevitable weakening and destruction, there is a steady increase in deafness, the blessings of which in even our noisy world cannot be described as altogether unmixed, though in the case of

such trades as boiler-making it may be chiefly a good. No one can look forward to the approach of this infirmity without misgiving, yet without it he runs the risk of brain damage. There is no middle way. It is admitted at once that there is a large section of the community which is neither deaf nor mad, but though it is a gloomy saying it is sufficiently true that these lucky beings are a progressively diminishing band. If to the number of men, women, and children definitely afflicted in either of the foregoing ways there be added those to whom the noise of towns is a perpetual irritation and lessener of efficiency (whether this be realised or not), it is safe to say that the bulk of the town-population would be included.

Justification of this contention by the facts is available but indeed hardly necessary, so complete is the possibility of a *a priori* proof. The syllogism might be put thus: the brain must be damaged by an incessant stimulus; noise is an incessant stimulus, therefore noise damages the brain. The headache in the morning after a drinking bout used to be prescribed for on the principle that there is value in "a hair of the dog that bit you," and it is still necessary in certain cases of chronic alcoholic poisoning finally resulting in delirium to consider whether there may not be danger in immediately stopping all forms of the so-called stimulant. Similarly in marked cases of morphomania there is occasional risk in the complete withdrawal of the drug. Exactly parallel to these is the brain damage ensuing after prolonged exposure to noise: every townsman has noticed the restlessness of the first night spent in the dead stillness of a country bedroom—a restlessness and sleeplessness caused by the lack of the accustomed irritant. But in the case of the noise as little as in that of the other poisons can it be argued that the tolerance has made this a good thing.

Damage to the brain by noise indicates that there is a deficiency in the mechanism by means of which we hear, for if a light becomes irritating the closing of the eyes will at least mitigate that nuisance and secure a temporary relief. The evolution of the ocular apparatus is to this extent then in advance of the auditory, and we can perceive no suggestion that at one future day man will be blessed with ear-lids. Dogmatism on the ways of nature is, however, unsafe, for function has so far been accommodated with its needs of structure, and it may be that these also will yet come.

Such lids or other ear-protecting mechanism will require to meet a somewhat complicated series of requirements, and indeed it would seem probable that men alone are likely to be so endowed. For it will be necessary not only that it can be turned on and off at volition, but that those noises which indicate pronounced danger shall always have access to the auditory nerves, and further in the case of woman that sleep (where above all it is needed) shall unclothe the aural chamber that she may not be deaf to the call of her child during the night.¹

Wool in the ears is an occasional relief though it carries its own danger, and the pathetic attempt of Carlyle to build a sound-proof chamber in his home at Chelsea is a model of the failures which have so far resulted from attempts to combat the evil from this side. The natural conclusion resulting from inadaptability of the ears and auditory nerves themselves is that the attack must be made on the other factor, and that prophylaxis must be directed to the noise, in the way of reducing it.

As was well seen in the case of the eyes, the more specialised the sense, the more sensitive is the apparatus

¹ On this point see "Evolution, the Master-Key," by C. W. Saleeby, M.D. pp. 288-9.

concerned with this. The skin nerves can become accustomed to great vicissitudes of heat or cold, and can summon reflex mechanisms to compensate for these without troubling to bring such matters to the notice of the brain and higher centres. The viscera may adapt themselves to a wholly fruit or vegetarian diet and so forth, frequently with no harm resulting; but a slight difference of degree or duration in the stimulation of eye or ear may lead to considerable mischief. In the eye it was found that this was largely traceable to default or damage of one small muscle, the ciliary muscle, and it is of some interest to observe that the tiny *stapedius* muscle of the middle ear has the chief brunt of endeavouring to neutralise the effects of harmful auditory vibrations.

Of the apparatus concerned with hearing all that is outwardly perceptible is the seemingly superfluous external ear or pinna. This is not quite so useless as it looks, for its indentations and irregularities have to some extent assumed that function which in the horse, for instance, is subserved by a very mobile and dirigible ear. In man also is some remnant of the power to "prick" his ears, for there are three muscles still attached to the external surface of each which it is still quite possible to bring into play by a little practice in the enthusiasm of a misguided physical culture. By means of them the ear can be elevated, retracted, and so on. They should, however, be allowed to lapse into that obscurity awaiting all vestiges. The human ear with its concha, helix, antihelix, and other variously named promontories and indentations, utilises these to gain ideas of the direction from which aerial vibrations are impinging upon it. Its irregular shape is distinctly serviceable for this purpose, as has been proved by leaving the orifice of the ear open, and filling the rest

to one flatness by means of vaseline or a similar compound. Its function is, however, very subsidiary. It is only after the curve of the external canal is passed that the fundamental hearing machinery is displayed.

A membrane or drum takes up the air vibrations which the canal has conducted to it, and transmits them by means of a chain formed of three minute bones to a still smaller membrane. That one of the three bones which is directly attached to this smaller membrane is called the *stapes* and is pulled on by the *stapedius* muscle, the function of which is revealed by its position and attachment: it is concerned with tightening or relaxing the inner membrane. The need of such a muscular action is clear when it is remembered that by the great diminution in size of the vibrating membrane which receives the concentrated vibrations of the large drum transmitted through the chain of bones, there must be a considerable increase of the pressure per unit of area thus transmitted. The *stapedius* by pulling upon the membrane can damp these down considerably, and thus ensure that too great an intensity of vibration shall not be transmitted.

Keep the *stapedius* muscle in eternal action and fatigue and inefficiency are inevitable. Itself will send messages of distress, and the unprotected nerves of the inner part of the ear will add their quota. The effect will thus be precisely analogous to what occurs in the eye when the ciliary muscle is straining in a bright light, the optic nerve and ciliary muscle sending in a joint protest.

When a loud sound is expected by the normal individual his *stapedius* muscle gets warning, and braces up the membrane to protect the sensitive auditory nerve. An unexpected loud sound, however, especially of high pitch, rushes straight to the unprotected nerve, and the resulting cataclysm in the brain may result in permanent, though usually only temporary, deafness. But if neither

results, evidently the brain cells to which the auditory nerve has promptly carried its blatant message have been unfairly treated, and results ensue to correspond. These may be read, *mutatis mutandis*, under what has already been written concerning vision.

The irritability of brain cells in the parts which have to deal with sounds, or the memories of sounds, is evidently likely to be a fruitful source of insomnia and all that this leads to, so that the genesis of auditory dreams, or voices, or supernatural verbal messages, is comparatively simple, and is readily explicable by the hyperæmia of overworked brain areas making these paths of conduction easy to those impulses which arise during the disturbed and unrefreshing sleep of so many citizens.

It is very evidently necessary to protect the *stapedius*: an indication of its usefulness will be vouched for by those who have suffered from certain forms of "facial paralysis," where the nerve to it has been affected; in such a condition a most distressing symptom is the "hyperacousis" or sensitiveness to sounds of high pitch.

That chamber called the middle ear, which contains the little line of ossicles stretching from membrane to drum, communicates with the outer air by means of the Eustachian tube, the other end of which opens at the back of the nose. The tube supplies air to the middle ear and maintains thus a certain tension of the air in it. Failure of the air supply leads naturally to absorption of the air in the chamber and collapse of the drum inwards, *i.e.*, more or less deafness, with increased possibilities of disease.

To keep the Eustachian tube open is, then, a very necessary precaution. This explains why so frequently a catarrh, such as arises in a common cold by extension to the nasal end of the tube, may end in deafness. There is one point in this matter of common cold as it affects the hearing which is of universal interest.

Presumably every one has noticed the tendency to deafness in the first few days of the cold. This is maintained by some to be a natural and desirable feature. It arises by a plugging up of the tube by some of that mucus which covers all the nasal surfaces at such times, and the contention is that this blocking is necessary to prevent the organisms in the nose from gaining access to the middle ear, and there possibly setting up abscess, middle ear disease, &c. Further, it is said that it is on this account not wise by forcible blowing of the nose or otherwise to remove the plug, since this access is thus made easy and almost certain. The idea is that as the cold departs the mucus obstruction will naturally come away. However this may be, it can hardly be wise to permit even such deafness to persist for more than a week, since, as already stated, other complications will then occur.

Catarrhs, at any rate, are to be avoided, and every other condition, such as enlarged tonsils, adenoids, swollen turbinate bones, and the other conditions which are so common in children, and which make middle ear disease an almost disregarded routine among the children of hospital practice.

From the relationship between throat, nose, and ear is enforced the value of care in the case of children of the mouth and its connections, and though a healthy child will usually sleep with its mouth closed, even in it the habit may be acquired of breathing with open mouth. That, when it exists, must be at once checked, for the mere passage of unwarmed air over the oral passages is sufficient to induce a catarrh. It is possible that some of the complications which result in mouth-breathing may actually be begun by it: it would not be the only instance known of a vicious circle. The baby's comforter may be mentioned in this place, to receive the usual condemna-

tion : it stimulates the saliva to an extent comparable with the tobacco-quid of adult life ; irritates the gums ; damages the future teeth ; is an admirable starter of catarrh ; is a possible damager and deformer of the bony parts of the jaws and palate ; is an unquestionable source of that sepsis which leads to summer diarrhœa ; is equally undeniably the origin of dyspepsias, and is most probably the cause in many children of the beginning of mouth-breathing, since a position of lips and teeth of incomplete closure is necessitated by the persistent presence of the dummy in the child's mouth. It is only just, then, to connect the comforter with middle ear disease and deafness.

The extent to which the children of our time are afflicted with deafness, from whatever cause, may be estimated in view of a statement made by Dr. Davies, that fourteen in every hundred children at school are sufficiently deaf to interfere with their progress. Yet children begin to hear distinctly in the second week of life.

The deafness caused by loud sounds is evidently preventible ; so also is that due to middle ear disease, since this is chiefly derived from conditions of the Eustachian tube ; and it should be needless to add that the deafness caused by wax in the ear is also a simple and in the first place a curable condition—on this fact is based the success of numberless quack aurists. But wax in the ear, in the manner of obscure eye troubles, may cause a vicarious suffering such as giddiness or vomiting. This is on account of a slip of nerve derived from the *vagus*, the great nerve of supply to the viscera, which reaches the ear. In obscure cases of sickness or giddiness this possibility should not be overlooked. But on account of the same connection between the ear and the various organs through the *vagus*, an ingenious theory

has been propounded to account for coughing in church, the straining of the ear in the bad auditorium of the ordinary church being held to explain an irritation of the *vagus* sufficient to cause the troublesome cough.

The best softener of troublesome wax is ordinary baking soda, a teaspoonful to a tumbler of warm water : a little of this dropped into the ears for several nights will sufficiently loosen the hard deposit for it to be removable by gentle syringing with the same fluid. Picking the ears for this purpose with a pin, hairpin, or match is a most dangerous procedure.

The age for beginning to attend to the ears is the age at which the comforter is likely to come into play, and by obviating that abomination the health of the child, as well as that of its mouth, throat, and ears, is definitely safeguarded. Other precautions—as these bear upon the throat, and hence the Eustachian tube—must also be taken in the direction of seeing that the child's food is of the proper temperature and not so hot as to cause any form of mucous membrane inflammation. Highly spiced food will be avoided on the same account. Colds have already been considered. The need for these preliminary measures has been recently proved by the extraordinary number of children who have been referred to their doctors by the school inspectors (medical), who have discovered in them enlarged tonsils and adenoids with their consequent diseases and deafness. Of 1,000 poor schoolchildren examined by Mr. Cheatle, 449 were suffering from adenoids in some form.

It is but right, since school is a cruel test of any child's capacity, that it should benefit to the full by the results of a searching medical examination when entering this, but it would be better that the need for such inspection were less acute. The health of the child is of State importance before it comes into contact with State procedure as at present

constituted. Has any one who reads this ever entered a town board school and listened to the appalling clamour from outside amid which the lessons are conducted?

There is much more in life than the necessity, important as this is, of being able to compete in hearing power with one's neighbours. The child or adult who is to any degree deaf is to that extent robbed of one of the greatest alleviations of human life, and this alleviation is based, as are most of the higher satisfactions, upon rhythm—in this case the rhythm of air vibrations. It is the recurrent gentle swish of a rocking cradle that lulls a fretful child, and though we may deprecate the rocking, or that which calls for it rather, it is as well to realise to what its soothing power is due. Those interested may, if they choose, compare this effect with the swaying in the leafy branches of our nearest animal kinsmen when they also rest.

Upon such rhythm depends the fascination of the youthful swing and rocking-horse. From it is derived the joy of lapping wavelets or the sterner surge of breaking waters, and the same cause operates in producing the thrill of life in the healthy by the onset of a stiff headwind. From the great primary dominants and mighty octaves of nature's moods, man has refined and differentiated till the three thousand cells of the inner ear which can take up aerial vibrations and transmit them to the brain are not too many for the varying sounds of music. There is no need to impress for purposes of emphasis such time-rounded phrases as "music hath charms" to prove how much of benefit to man may be derived from the mere stimulation of auditory cells. The pied piper and Orpheus have existed in every time, and music has always soothed the living weary, invigorated the feeble, and still further spurred the vigorous. The blast of the trumpet which shook down the walls of Jericho is good allegory.

It is not needful to dwell further upon the value, utilitarian

as well as æsthetic, of all music. The people everywhere appreciate it and welcome it: it is becoming one of the things which life is for, so that there should be no pains spared to guard the mechanism by which this is alone attainable. We judge a man by the company he keeps. There is a constant endeavour to prevent the people from seeing sights that are revolting, indecent, or unworthy; yet we permit such acoustic indecencies as the blare of a motor-car to intermingle with the harmonies of a "Tristan und Isolde," or with the sweeping diapason of the organ of a cathedral.

When the eye is offended, though we may not follow strictly the injunction of Scripture, we can at least pluck it away; when the ear is offended there is no redress. The first sound that should meet the wondering ear of an infant ought to be the tender tones of love. We are not yet cynical enough to doubt that these impressions cannot be recorded too early, and we are not yet too scientific to know that these must be of value. The training out of the "ape and tiger" cannot begin too early. There is beginning to be understood the need to watch what visual stimulations shall perpetually meet the infant's eye; the need to attend to what it first must hear is equally great.

What had best be heard is, then, a matter of some importance, but that what is and must be heard shall do the least possible damage to ear, brain, and nation has first to be ensured, while along with this, and of still earlier importance, is the need to see that the children and people shall hear at all.

The practical suggestions for stopping the various injurious noises are simple and evident. Dogs—and this is necessary for more than reasons of noise—should be completely eliminated, or a noiseless breed evolved. Street cries are valueless, and there is no hardship in stopping them, or bugles, whistles, horns, or other noisy device for taking their

place. Men must learn to use those noiseless reminders of the passage of time which they have had in universal use for generations, and if a man will not trouble to look at his clock or watch in order to get to work or business in time, his ethical sense requires cultivation, and his neighbours should not have to bear the horrible hooter or buzzer of the works which takes its place. Bells and chimes are not needed as advertisements of religion, or of any commodity of the market-place, and should be suppressed accordingly. If in addition to these changes streets were asphalted or otherwise made suitable for the free use of rubber tires on all vehicles, and these then made compulsory, and the ordinary heavy-footed citizen compelled to wear rubber-protected heels, there would be still enough noise in a town for it to be plain that man was justifying his existence by strenuousness.

When these matters have been attended to we may be able to attach that value to discordant sounds which appealed to Browning, and be more able to sympathise with that instinct which prompted him to write, "Why rushed the discords in, but that harmony should be prized."

Equilibration

In speaking of the effects of rhythmic stimulations of the ear, attention has been directed to only the actual auditory share in these. But closely associated with the organ of hearing, and innervated by the same nerve, is a separate mechanism composed of three semicircular canals arranged in three planes at right angles to each other. The fluid in these canals communicates directly with that contained in the inner ear, and must therefore be susceptible of the same stimulation as that which is concerned in hearing. But the influence of this is very different. By the movement in or out of the fluid in any canal we obtain our sense of position in space, and the three combined serve us for equilibration

and probably also in understanding that space is tri-dimensional. In the lamprey there are only two such canals, and it would be interesting to know whether to the lamprey the world is entirely plane.

From this apparatus for equilibration is probably derived the sensation which gives pleasure in dancing, on account of the rhythmic ebb and flow thus induced in the canals.

It is possible that those aerial waves which play upon the organ of hearing must also affect equilibration, and to this may be ascribed the giddiness frequently caused by too loud sounds. What is certain is that the canals help us in understanding life and in keeping a balance, and it is only reasonable to assume that what may damage the ear may also damage them: they have a share when maltreated in causing vertigo, and though it is not possible to dogmatise further upon their function, we are at least sure that they are not mere vestiges, and that the damage to the ear which must react upon them cannot be otherwise than bad for the brain and body on their account also.

CHAPTER XIV

THE NOSE

Smell an advantage or a disadvantage?—The *Odor Humanus*—Anæsthesia by hail of olfactory particles—Scherl and high pavilions—The sensitiveness of smell as proved by ambergris—Micro-organisms of disease are odourless—Intimate connection of nose and brain—Value of smell in animals—Protective in man to a minor degree—Smells and disease—Odours and health—Aroma, bouquet, &c.—Connection between smell and hearing by nasal mucous membrane—Importance of preserving the membrane—Investigation, therefore, of proper breathing—Mechanism of the nose—Filtering—Sneezing, “running” of nose, blowing it, all protective devices—Snuff, ammonia—Dust, and “nasal” speech—The handkerchief—Shape of nose—Hay fever and corollaries—Grasse and orange-blossom epidemics—The tests of smell.

WHETHER or not the sense of smell is more of an advantage or a disadvantage to the dweller in cities where cats, dogs, horses, factories, and man himself is allowed to pollute the atmosphere need not be discussed. It has been said that that odour which we prefer to express politely as the *odor humanus* does not exist in Japan: we have at least the satisfaction of knowledge, if no other, that it is unlikely to depart from England while England exists. No amount of so-called personal cleanliness will secure such an ideal while we adhere to our present system of clothing—I have not yet heard of any one who considered it necessary to have his outer clothing washed every day, yet a very cursory examination under the microscope of any part of one’s jacket, coat, or skirt would

give full justification for such care. Some would be able to do this scrutiny and its findings full justice. Here it had better, perhaps, be left to the individual imagination, with the suggestion, however, that what is found upon the surface of the street can in no way differ from the extraneous contents of the clothes.

It has already been observed that the townsman is battered to distraction and deterioration by incessant auditory and visual stimuli: to these must be added the persistent hail of noxious particles which select the sense of smell for their victim. As a result of the persistence of olfactory stimulation there has fortunately been arrived at a condition of indifference in the majority of us, but no more than in the case of irritation by lights or sounds does this anæsthesia of habit in any way prove that no effect is produced. It is well known that each great city has its distinctive smell: a return to London after even a few weeks' absence will rapidly convince any except the anosmic of this truth.

An interesting suggestion was made recently by Dr. Scherl to the Berlin town authorities on this very point of the noxious smells of towns, and their other sources of unrest and irritation to citizens. He proposed the erection of various pavilions throughout the city at a height of some 150 feet above the street level, as a means of securing rest amid good air, flowers, and other pleasant surroundings.

Possibly it will help to make clear that this town-produced olfactory anæsthesia to certain stimuli is actually a factor of some importance if it be realised how extraordinarily sensitive is the mechanism for transmitting "smell." The actual nerves themselves, on account of their position high up inside the nasal cavity, cannot be directly investigated, but one fact will prove that this sense is quite as delicate in its way as is the retina to

light. Haller found that a morsel of paper impregnated with a particle of ambergris which could only be approximately represented by a fraction of which the numerator was 1 and the denominator 2,500,000,000 parts of a grain, maintained its distinctive perfume for forty years. The city-made origins of what contribute to bombard the citizen's nostrils need not, it is hardly necessary to say, be measured with this accuracy.

This discussion, it should perhaps be said, has nothing to do with the question of disease: we are considering merely the sense of smell: it is an extremely curious fact that those micro-organisms which are perceptible by the nose are the non-pathogenic—such germs as those of cholera, small-pox, tuberculosis, or measles may be swarming in the air without our receiving any nasal warning, and as a result the mucous membrane of the nose contains representatives of more than thirty varieties of bacilli, some of them, such as the different micro-organisms of suppuration, capable of developing a very rapid virulence, as witnessed by erysipelas or cellulitis from a scratched nose.

The nerve filaments which supply the membrane chiefly concerned with smell are derived from an outgrowth of the brain itself, differing thus from all the other cranial nerves, with the exception of the optic. From the intimate connection of the nerves of smell with the brain may arise the extraordinary powers of association that are called into play by many distinctive odours: there is no more powerful stimulus to the recollection of scenes and other memories than the scent of flowers. It was Ophelia who said, "There's rosemary, that's for remembrance," and there is still a language of flowers for the romantic.

On account of the intimate connection between brain and nose the olfactory nerve would appear to have been selected among animals as an important aid to their

preservation. The associations conveyed are so immediately developed that the least possible time is spent in perceiving danger, and in addition to this there remains the fact that, while the eye is, perhaps, quite the easiest sense-organ to deceive—a truth which is taken advantage of in the colouring of all the carnivora blending readily with their surroundings—it is not possible for the sense of smell to be so distracted; the manoeuvres of the fox, for example, which covers its scent by running into sheep, are not forgotten, but that is not quite the same point.

As a protective faculty, smell in man has of course greatly degenerated, though it will still give him warning of escapes of such dangerous effluvia as coal-gas, emanations from drains, and so forth. The statement need hardly be made that it is not the vile smell of farm-abominations that makes such places healthy, but that the air surrounding farms makes them healthy in spite of the smell. As already stated, the protective power of the nose is immensely nullified by the pathogenic bacteria being odourless, and it is from this side that man's life is principally threatened. There is a popular impression to the effect that a bad smell can cause sore throats and other ailments, such as diphtheria. The latter view we know to be incorrect, and there is ground, therefore, for doubting the idea in its entirety, since it is probable that the micro-organisms of any special affection would require to be inhaled at the same time as a bad smell is perceived for disease to result; but there may possibly be an actual depressing effect produced by special odours. The whole matter of the relation existing between bad smell and disease is indefinite. It is certainly wise to keep away from any objectionable odour while the subject is being elucidated.

There is still, however, value in odours as attractive and pleasure-giving agencies. The scent of flowers, of pine

forests, and that odour which is supposed to be due to ozone, induce the individual so fortunate as to inhale them to take deeper breaths, in order that he may increase their agreeable stimulation, and the beneficial effects of deep inspirations require no statement. In a different respect, as an incentive to appetite and the secretion of the appropriate digestive fluids, odour, aroma, or bouquet have all their uses. Fortunately, too, it is still occasionally possible, despite the perverse devices of a dishonest age, to distinguish bad food by its smell. In these matters it may be admitted at once there is justification for the continued active existence of the first cranial nerve.

If, however, further inducement were required to make men preserve their power of smell it would be at once obtained by recognition of the unavoidable association of the mucous membranes connected with this sense and with hearing. The commonest interference with the transmission of olfactory impulses arises from maltreatment of the lining membrane of the nasal cavities, and in this membrane lies the opening of the Eustachian tube, by means of which communication between the middle ear and the outer air is maintained. Evidently any catarrh or inflammation which affects smell must also affect hearing, a statement which is equally true when reversed. However doubtful one may feel as to the preponderating advantages of possession of smell in towns, there can be no dispute as to the need for guarding our hearing to the utmost, so that, from the interdependence of the two faculties, the question is settled for us. We may resign ourselves, therefore, to the continued possession of smell, and, since it is clearly incumbent upon us to preserve the olfactory membrane in the best possible condition, it is as evident that the acuity of smell thus maintained should not be liable to abuse by persistent and harmful stimulation.

This means the necessity to supervise carefully the air which passes into the nostrils, and that should include practically all the air we breathe. Smokers who are in the habit of exhaling their smoke through the nose have grounds for their belief that they are thereby helping to disinfect the nasal chambers, but it is well to remind them that the chief agent in this disinfection is formalin, and that formalin while a powerful antiseptic is an equally powerful irritant. It is known probably to most that mouth-breathing is thoroughly objectionable and conducive to every variety of catarrh of the mouth and pharynx, if to nothing else: cold air—and all air is cold when compared with the temperature of the body, in our country at least—should never reach the commencing air passages. In the nasal cavities lie a series of spongy bones which are extremely vascular, and which form in fact a simple heating apparatus for all air which passes over them—hence one advantage and necessity of nose-breathing. Mouth-breathing must certainly conduce to bronchitis and pneumonia on account of the direct transit of cold impure air from the outside to the air passages, and since respiratory diseases are the chief curse of England there is reason for maintaining the open nose.

In the light of the necessity for universal utilisation of the nose as breathing medium, there is an explanation of the existence of those hairs or vibrissæ within the nostril which are so objectionable for æsthetic reasons. But this is especially a place where epilation should not be practised. Such hairs are admirable nets for entangling the grosser particles of dust and dirt which salute one everywhere, and particularly in towns. It is true that in those who do not possess them the dirt will pass straight through the nose and be finally carried by the action of ciliated cells lining the nose into the naso-pharynx and finally the stomach, but there is no crying need to

add to the amount of dirt man must eat while he lives—there is little fear that he will not exceed that “peck of dirt” which formed the basis of so many sage encomiums by our grandmothers. Certainly this is a case of “out of sight, out of mind,” but it is perhaps not undesirable that unclean nostrils, hair-impacted, should sometimes remind us of the kind of world we live in and the air with which it provides us: so though we need not imitate the shaving of the nostrils common in other races, let us remember to wash them once or twice daily.

Whether there be hairs to remind us of the fact or not, it is not to be forgotten that there is a necessity to attend to the nasal toilet. The direction of the entering air current is such that all the air impinges at once upon the anterior part of the septum of the nose, so that much of its bacillary and other finer contents is deposited here. Further deposition of any impurity left is enforced by the tortuous channel of the internal nasal cavity. Air thus inspired will very evidently contain little impurity by the time it reaches the larynx and windpipe. A certain amount of this débris is eliminated by using the pocket handkerchief; a larger proportion passes on to mingle with the mucous secretion of the middle and posterior parts, and, aided by the current from the tear-ducts which open into the back of the nose, passes into the throat and finally reaches the gullet and the alimentary tract. But there is a considerable quantity which remains and which requires more vigorous dislodgment. Nature attends to this by too irritating an accumulation causing sneezing, or an increased secretion of mucus, which latter occurrence we recognise by the nose “running.” Blowing the nose vigorously ought, however, to be one of the fundamental rites of health, and the time for practising it is the last thing at night and the first in the morning. The more trumpet-like the blast with which this is

accompanied the more successful is its execution. This performance affects also the Eustachian tube, and reinflates the middle ear. Sneezing acts in the same direction, and in this is the sole excuse for an occasional pinch of snuff. Snuff-taking without sneezing, while it may mark the connoisseur, condemns the man—he is further encumbering an already sufficiently laden membrane, and deserves all the catarrh, loss of smell, and deafness which he dares to provoke. It is worth noting that sneezing caused by snuff, ammonia vapour, and other irritants is due to stimulation of the fifth cranial, the nerve of common sensibility to the face, and not of the olfactory nerve proper.

All dust, of whatever kind, is matter out of place, so far as the nose is concerned, but certain forms of it are peculiarly irritating and productive of catarrhs; that in potteries, for instance. In many parts of America the dust is alkaline and especially harmful, from which arises the great frequency of naso-pharyngeal inflammations. It is not authenticated, but this fact would suggest an explanation of the nasal speech of so many Americans, "nasal" speech being, of course, the reverse of nasal and meaning that the nasal cavities do not take their vibratory share in the formation of speech.

The use of the handkerchief requires mention. Our present method of carefully wrapping up all the detached nasal secretion, with its attendant bacilli, and of then placing them in the favourable warmth of a pocket, is absolutely abominable. It has been urged again and again that the linen or silk article, by the use of which the comfortably situated distinguish themselves from the beggar, should be replaced, if not by the free and easy methods of the latter, by an article made of paper which could be at once destroyed. Dried tubercle bacilli are flourishing upon the handkerchiefs of one out of every

six people in England, and one in every six of us succumbs to their attack. A mortality rate of this extent would appear to merit some consideration, but while there are a hundred men to condemn utterly the skirts of women, which acquire these bacilli indirectly, there is hardly one to perceive the danger he carries next his chest. Paper handkerchiefs, after the Japanese model, are now attainable in England; this is a matter worth inquiring into. Scent on handkerchiefs, so objectionable to the average man, is yet antiseptic in so far as it contains alcohol and volatile oils, and is to that degree therefore commendable.

The shape of the nose is of little importance, though there is some prepossession in favour of those forms which indicate good capacity and which possess wide nostrils. The well-opened nostril and the patency of the channel are the important points, and to these, it is needless to add, the latest cosmetic device of injecting paraffin to alter the shape does not attend.

The actual effects of disease upon the nose need not be considered, though passing allusion may be made to hay-fever, a condition frequently affecting even the apparently healthy. It is due, in those cases where actual disease is absent, to a hypersensitive state of nasal nerves as regards special odours. The irritating pollen from grass has given the generic name, but it may arise from the odour of special flowers, or animals. In midsummer the little town of Grasse, in France, is subject to veritable epidemics of hay-fever caused by the picking of orange-flowers, and this occupation may even lead to a peculiar form of syncope. A case has been recorded where an attack has been brought on by the picture of a rose. It is interesting to class along with this manifestation of the effect of the selection of special smells, the result which the sight of certain animals has produced upon

many famous men; and probably in some of these instances, for example that of a famous British General who cannot endure the presence of a cat on account of a lively sensation of fear induced by it, an olfactory element participates. Of the same nature may be the horror inspired by a mouse in the elephant, by a camel in horses, &c.

Those who are desirous of perceiving whether their sense of smell is vigorous should test it with various volatile oils, such as cloves, peppermint and asafoetida. Ammonia is not eligible in this connection, since, as already said, it affects also the fifth nerve.

To complete the parallelism between sight, sound, and smell it may be added that there may be hallucinations in the mentally unsound of all three senses, and that the stimuli which affect each sense organ are analysable into a very limited number of fundamental "tones." Vision, it was said, derived all its colour schemes from four elements; hearing depends upon fifty, while the olfactory joys of the gourmet and flower-lover, like the woes of those sensitive to the emanations of a city, are built out of a basal scale of eleven olfactory units.

CHAPTER XV

POSITION

Position in utero—Indian papoose—Shawl-carried children, &c.—Chinese foot—English boots—"Crossing the legs"—Faulty boots causing to walk "softly"—No excuse like this, however, for "soft sitting," which is the position of our age—Dependence upon ligaments—The anatomy of joints—The importance of muscle tone—Undue utilisation of gravity—The ill-effects—The sitting of children in school—Rightsidedness and speech—Onesidedness in the effect upon the nose—Effects of the desk upon children—"The White Company"—Drill as ineffectual exercise.

Writer's Cramp and other Disabilities.—Early massage—Pianists—Cigarette rollers—The standing of policemen, teachers, shop assistants, &c.—Short stature due to the thighbone—Squatting position of Japanese.

Good Position.—Form—Style—Grace—Due to parsimony in Nature—"Handiness"—The value of position in sport—Penalties if too protracted—Beauty of price—A retiring curve desirable for ordinary uprightness—Effects of facial muscles upon brain states—Frowning—Smiling—Of value to inhibit all position or muscular groupings in falling—Testimony from children.

Knock-knees, Bow-legs, &c.—The fewer the stereotyped positions the more flexible is the body—The recumbent and no other is the proper position of rest.

OF an importance which is readily perceived in every condition of nature, it is not strange that in man also position should have a definite value, and, since in his case nearly every position that concerns us is the result of muscular action, in the activities of muscular groups chiefly must be investigated this problem. Other factors that may operate in the direction of pro-

ducing actual deformity will naturally affect position and will require consideration.

The unborn child spends several months in a position that would lead one to expect a permanent modification of the bodily form of its after-life. The head is bent forwards, with the chin, and almost the face, touching the chest, the arms are folded, the thighs flexed upon the body and the legs upon the thigh—there is the greatest possible economy of space with a consequent closeness of packing—yet this position is at once recovered from at birth, and hardly ever thereafter reproduced save during sleep in the first month or so, while an occasional reflection of it may be perceived in the huddled-up attitude preferred by even some adults during repose. No deformity in fact results, and any malformations of limbs, trunk, and head in young children are due to other causes. The Indian papoose is strapped rigidly to its mother's back and carried thus for hours with no apparent harm resulting. The children of the lower classes in some parts of Scotland are swathed tightly in numerous folds of a voluminous shawl and carried for long periods in this fashion; yet, though an Englishman professed to discover in this the reason for any number of deformities perceived by him in the slum children of Glasgow, there is absolutely no evidence to prove his contention. Children are fastened into perambulators so that movement of the lower limbs is impossible, yet permanent harm is hard to discover. In all of these instances considerable force is exerted—the saving feature appears to be its intermittence.

For an example, however, of what can be done by the application of force without intermission, the foot of the Chinese lady, which may be compressed into a space some three inches long, is the typical illustration. We have little reason, however, to dwell too exultingly on this

matter of the feet, since it is hard to find in England a perfectly shaped foot. The boots of the period are apparently still modelled on the peaked metal footpieces that went with the armour of those happy times when it was necessary to kick hard and once for all, in the so-called age of chivalry. It is difficult to disbelieve in the transmission of acquirements when one finds the bootmakers of our time deliberately imitating in leather the pedal masterpieces of many centuries ago—we are happy at last to observe an occasional worker in this craft who has discovered that leather is flexible, and that it is not essential to mould the foot to the shoe. Ultimately, there seems some reason to believe, this truth will have a general recognition and find its reward as does all truth in an advancement of the comfort and health of the body, in conformity with the extent to which it is recognised that the position of the bones and parts of the foot has been arranged in harmony with the requirements of locomotion and progress. The fact has not been verified, but it is possibly due to the discomfort of modern footwear that the attitude of sitting with one leg crossed over the other has been so generally adopted. In this position the great popliteal artery at the back of the knee is compressed and less blood sent to the foot, so that congestion is to a certain extent relieved, with a corresponding diminution of an ever-present irritation.

To this same cause—the maltreatment of the feet—may be traced, as has been noted under “Feet,” faulty positions of the foot itself, and hence of the lower limbs in walking, with consequent and natural defects in carriage, gait, walking ability and health, as might be expected when a generation has perforce to imitate Ahab and “go softly.”

But if, through no fault of our own, we have become a people who walk softly, that is no excuse for the extent

to which soft sitting and soft lying have become an indulgence. The bed has already been disposed of, but it may be pointed out that those who lie submerged in feathers are| bathed in a sea of objectionable vapour which, where the bed billows round them, has no opportunity of escape—ventilation is at a minimum, and this is bad for the skin and correspondingly bad for the bed, which cannot but become sodden, palpably or impalpably,

Sitting there is far too much of. We have abolished the older method of reclining at meals in its favour. We sit at concerts, lectures, business, school, cricket, football—even war is not seldom directed from an armchair, or at least its camp equivalent. Instead of miles of exercise to communicate with a distant friend, we sit down to the telephone or in a Pullman car. The cinematograph, the post, the press, and the telegraph bring all our needs to our chair. Yet some of Carlyle's forty millions must still justify his description by actual motility and work, though it is wonderful how seldom one meets any of them. Modern man has discovered by practice a fact which it requires the knowledge of the physician to express concretely. He has found that less energy is required to sit than to stand, and much less than to go about. Medical knowledge informs him that the heart beats several times fewer in the sitting than in the erect position. Possibly the nation then is resting its heart!

There is, however, no worse state for the healthy, untired body than that developed by this perpetual sitting, and particularly in the form to which we have brought it by our ingenious upholstery. The padding of seats is not now merely a form, and their backs are designed for use. As a result, man has come to depend more and more upon his ligaments. The meaning of this is clear: any joint consists of the participating bones, and the ligaments of strong inelastic tissue which bind these together. But

in addition, playing over every joint and contributing largely to the proper apposition of its bones, are the tendons of muscles. The shoulder joint, for instance, did it depend wholly upon its ligaments would leave a space of an inch or two between the bones, though this is an extreme case. Comparatively inextensible as the ligaments are, if day after day, and year after year, the same forces are persistently brought to bear upon them, and none of the strain relieved by the tension of muscles, then inevitably they must yield, though it be ever so slightly. So that this is what does happen in those people who, when sitting, allow all the weighty parts bearing upon joints to sag down under the influence of gravity, with never a bracing relief by any of the surrounding muscles. It is simply a case of throwing all the stress upon mechanical structure without any assistance from vital energy. As a result of the slow weakening of special ligaments special "sets" of the body are obtained. You may perceive it in the "Eton slouch," though this is in no way dissimilar from the usual shambling gait of the average citizen. It is readily perceived that, when muscles are less and less called upon to do their share in maintaining position, but are encouraged to the greatest possible relaxation, these also must lose "tone" by becoming accustomed to an extreme degree of this. As evidently, when muscle is required to brace parts up to the full normal, it has first to take up the "slack" so engendered before it can begin to make effective effort—all of which is clearly against speed, economy of effort, and efficiency. Want of tone in the muscular system—which contains fully one quarter of the blood of the body—must be reflected in the general health, and in addition to this that peculiar condition of the brain which gives the colour and richness to perceptual and emotional backgrounds depends chiefly upon the continual messages that

are sent from the muscles and viscera, so that sagging bodies will naturally account for anæmic and colourless minds.

The dependence upon the ligaments is marked in the postures of this generation in much more than merely sitting, and the results are identical whether a man stands with loosened knees or leaning against a wall or post, slouches with forward drooping shoulders instead of walking with a muscular and erect carriage, or sits or lounges for half his time. The effects of perpetual sitting in the case of women add to the general bad results by congestion of their pelvic organs, as a result of which even so unobservant an entity as the middle-class young man begins to perceive that the typewriter girl, telephone operator, telegraph clerk—women in business anywhere, in fact—are physically deteriorated for the duties and pains of motherhood. The reasons are obvious to those with a little anatomical knowledge: the engorgement of veins induced by sedentary occupations, and which results in deficient action of the bowels and frequently also hæmorrhoids, has a similar engorging action on the female organs of generation, and the result is a catarrhal inflammation of singularly persistent and debilitating character leading to unhealthiness and frequently malpositions of the womb. Children in schools are subject to precisely these influences, and no girl of thirteen or over should be allowed to spend more than two hours a day in continuous sitting. It would be considered harsh treatment to make such children spend two hours in continuous walking, but the latter would do the less harm.

Not only the older children at school, however, suffer from the folly of enforcing the use of seats. It is absolutely too much to hope that the school of the future will allow the children in the lower departments to lie down or sprawl at intervals, though this is very necessary for

their health and backs as well as for their limbs. At birth the backbone or spinal column from neck to lower loins shows only one long curve with its concavity forward. Very shortly a curve at each end in the opposite direction begins to appear. These are the cervical and lumbar curves, and the completion of them gives that distinctive erectness to the human carriage. If a baby is made to sit up too soon evidently its heavy head by falling forwards will help to maintain the original single forward curve of its extremely flexible backbone, and the result is that spinal deformity known as kyphosis. Any too early or persistent strain on the incompletely ossified spinal column of childhood will indeed tend to produce deformity, and the curve of the deformity will naturally vary with the special malposition most practised.

Put a child of even five years at an infant school desk; teach it to lay its left arm on the desk while it uses its right hand in making pothooks or something equally malign; keep this up for a year or two, and if there were no deviation in the size of the chest, the height of the shoulders, the sight, and the power of the hand on the two sides, this would be more extraordinary than the occurrence itself. As an interesting development in connection with the early preponderance which is given at school, if not elsewhere, to the use of the right hand may be noted the hegemony which is possessed by the left side of the brain, for on the left side of the brain is situated the all-important centre of speech. The left half of the brain, of course, governs the right side of the body and *vice versa*, and it is assumed that the choice of the left position for the centre of speech is due to there being need of the closest connection between it and the most active working half of the brain and body. The fact that if you have ever the misfortune to be stricken with an apoplexy of the left brain, you will probably lose your speech, is intimately bound up

with the fact that you have been right-handed. Left-handed people speak with the right side of their brain. Ambidexterity should on every count be inculcated from the beginning. There is no need for special training in onesidedness.

In even those individuals who have suffered least from their schooling and other harmful features of modern life, but who are right-handed, there is a definite curvature of the spine towards that side, associated with the more powerful action of the muscles of the right shoulder, arm, &c. A point that will appeal little perhaps to men, in this matter of the use of the hands, is the effect which a life-long use of the handkerchief from one side only exerts upon the nose. In very few people is the septum or indeed the nose itself in the middle line.

We are not quite, however, finished with the disabilities induced by stooping over a desk, for no matter how scientific the desk, this stooping must occur in those who sit at it for hours at a time. It is, of course, quite a point that constipation in children is greatly aided by their school position. The effect upon the chest is so well-known that this is only repeated for the sake of comparative completeness. Both shoulders must fall forwards and downwards, with the result that the breathing becomes chiefly abdominal and the chest expansion defective. Provision should be made for allowing the children to change their position frequently, and if the stools or seats are made single, and these and the desks of the proper height, standing can be taken advantage of to exercise the lower limbs. But as already said, any child till, say, the age of ten should, in the ideal condition, be able to sit, stand, or sprawl, at intervals, as much in school as out of it. In one of Conan Doyle's books ("The White Company," I think) two small boys are discovered with arms (bow-arms) outstretched in order that these may become

rigid and absolutely steady in taking aim. I do not know whether the Doctor himself would approve of such training, though if it attained the desired result it might be suggested in the training of a rifleman. Possibly for the special purposes of mediæval English archery the position had its advantages, though it could not but retard proper development of such arms for any other work, it is simply an imitation of those deliberately assumed rigid attitudes which count to the Indian Fakir for holiness. That, too, is precisely what the docile stiffness of school-children does. It trains them excellently for that stiffness of body which is apparently desirable in schools, but certainly nowhere else. Is there any sense in the outcry for physical training, culture, games, athletics and so on, when these are required chiefly to put right what should never have been allowed to go wrong? Why, in schools, should an unphysiological training in useless and harmful positions and lack of movement be insisted upon, unless it is imagined that the harm which scores of teachers will admit would be worked by similar procedure out of school is suspended by some marvellous interposition when this is carried out under the ægis of a Board?

In the best offices the desks for the clerks are at such a height that standing can readily be indulged in as alternative to the universal sitting, and it is needless to go farther than to ask one of these clerks as to the relief from the cramp and monotony of one position so obtained.

Drill, I believe, is also a part of the effort to put this school "education" on a proper basis. Children have to take the same length of step no matter what their respective sizes may be, they walk as best they may, they "double" at paces which every child would laugh at in its own play, they look to the right and to the left at the word of command, they form fours—and this is "exercise." As a lesson in restraining every natural tendency

of the body when the child wishes to play—as an exercise in inhibition, in fact—this drill may have value ; but as the unfortunate children have already sufficient of this training in inhibition while they are within the walls, it is simply unnecessary to carry it on when they are outside—and if they are not outdoors for drill they ought to be. There is no justification whatever for this drilling—play for the same period would be much more valuable. A healthy man or a healthy child, who has never seen a soldier or a drill-instructor, will walk well upright, and with an infinitely preferable carriage to that of the professional soldier—which is more reminiscent of corsets than anything else. Let the children play. They are neither little men, little women, nor, as many forget who at once admit the two foregoing statements, little soldiers. In lieu of no exercise whatever, choose drilling, but if there is any other choice take it. Musical drill, however, unquestionably pleases the children and gives them a pleasant change.

But clerks and children are not the only sufferers from monotony of position or action. “Writer’s cramp,” induced by the continual use of one set of muscles, is one of the best known of the disabilities induced by faulty position. Those who write from the wrist are most likely to suffer from it, and wrist writing is naturally that which we are taught. Appearances may be disregarded with advantage in such a matter, and, though writing from the forearm with the whole hand moving may not look as neat or businesslike, it has its compensations. The bulk of modern writing may now, of course, be done by typewriters of various adaptabilities, but such writing as that required of the cashiers and other officers of banks who have, for example, to sign the books of cheques, can, so far, only be done by the pen, and there is no more cramping penmanship than this. Daily massage of the muscles concerned is a useful preventive, and one to be quickly

adopted, as the condition itself is sometimes extremely intractable. The cramp itself is accounted for by the tetanus of muscles and nerves suffering from the "irritability of weakness," in which muscular contractions, instead of acting at definitely separated intervals, fuse into one spasm. Pianists are occasionally similarly afflicted, and this is hardly to be wondered at if it be realised that a Paderewski, for instance, is capable of thirty consecutive finger movements, representing many more muscular contractions, per second: it requires a first-rate ordinary pianist to perform the same movements eighteen times in a second. Cigarette-rollers are liable to a similar infirmity, as any one would expect who had once seen them at work.

The incessant standing of policemen, school teachers, shop assistants, &c., accounts for a deformity which, in its earlier stages at least, is accompanied by a very considerable amount of suffering, but "flatfoot," while it may well be antagonised by tiptoe exercises in its beginnings, is best warded off altogether by the wearing of strong, thick-soled boots: such boots need not cause the objectionable clumping noise that used to be associated with their use, since indiarubber heels are now accessible to even the poorest. The varicose veins of the legs, so common in those following these and similar occupations (so far as the standing is concerned), are naturally not affected by merely thickening the sole of the boot, but regarding these must be given the advice concerning judicious massage and counteracting exercises, with the tonic and bracing effects of cold douching at least once a day. Housewives belong to this category, since their minute excursions are quite comparable with standing still, and little in the way of valuable exercise is obtained by the restricted walking inside the house, which is frequently their only attempt at bodily culture.

It has been suggested that the squatting attitude

practised from time immemorial in Japan will account for the small stature of this very active and otherwise well-developed race. This suggestion derives some plausibility from the fact that height is largely dependent on the length of the thigh-bone, and that the difference in length between the backbone of a Japanese and that of an average-sized Englishman is much less proportionately than the difference in length of the thigh-bones; and the femora are naturally the bones most affected by squatting postures. To this may be added—though as a single factor we have already decided it to be of little importance—the position in which Japanese children are carried by their mothers, or sisters, a position which has some points of resemblance to that of the Indian papoose.

Little need be said on the point of how awkwardness of position conduces not merely to inefficiency in the special action concerned but also to fatigue, and the desirability of the most economical posture is proved by the value we attach to it in the commendatory terms of "style," "form," "grace," "poise." Nature with her "lines of least resistance" and other devices covering the same design, has seen to it that in position the easiest way is again the best. There is more than an æsthetic satisfaction in possessing a good style whether in batting, boxing, or walking, since such possession indicates a harmony with a deep-laid parsimony. The wrist of a Ranjitsinjhi is as effective—and infinitely pleasanter to watch—as the mighty "slog" of a Hirst. It is at least significant that there is something in man which has always turned him to seek the economical method of utilisation of the bodily powers, and the fact that the best position is always that which receives the praises of the connoisseur as well of beauty as of the special skill concerned, would suggest a very potent reason

for that development from different aspects of this economy: is this also a proof, as the physicists inform us, that the available energy of the world is a limited quantity and to be used without extravagance?

Whether or not the last supposition is worthy of consideration, and as the originator of it one is not likely to condemn it, good position, however described, has always received its reward. It has, in fact, a definite "survival-value." This truth may be easily traced in the history of a South African war, for example, where inadaptability on account of acquired and stereotyped bodily attitudes had a decided share in increasing the British death-toll. It may be worthy of note that sailors, who cannot be accused in the past of any stiffness of position, have received the nickname of "handy-man"—for which traditional muscular readiness they are indebted to the fact that the emotional material on which their craft is plied rejected decisively and finally the individual whose muscles were too rigid as much as him who went unbraced. It is one of the ironies of national character that to Britain the soldierly carriage has appealed more than that of the sailor. With the passing of drill, however, there is now hope for a better fate.

In the field of athletics as much as in that of war "position" has shown itself worthy of consideration. The sprinter has had it forced upon him that the "dap" start will give him an equivalent to a yard or two in the hundred; the high-jumper, by the mere substitution of a straight run at the bar instead of the sidling attack, has occasionally added four inches to his jump, or sometimes *vice versa*; the batsman has had it borne in upon him that a "straight" bat is more than an inherited phrase; even that conservative British institution, the Turf, has been impressed with a truth derived from American sources, that there is more in riding

a horse than merely sitting it. The shot, too, who can carry his gun for hours across his chest is least likely to miss chances. And, as for each sport there is a position from which the best results are to be obtained, so there is the corresponding penalty for too frequent a use of such position, from which there arises a "tennis elbow" by the nipping of a certain nerve between the heads of over-exercised and developed muscles; the "rider's bone" from the ossification of the tendon of the gripping muscle of the thigh where it reaches the bone; golfers are threatened with "in-toes" and cyclists with "cyclist's head" and so on. For each employment of the body, whether dignified by the name of work, sport, or merely amusement, there is for each individual a best position, but though such position ensures the best results with the least fatigue, there is in this no presumption that over-indulgence will fail to meet with its merited penalty. Life, in fact, is an eternal witness to the folly of monotony, no matter how this may be disguised or made palatable.

Position, then, like habit, may act as a conservator of energy, when it is properly utilised, as may be seen in even so simple a matter as holding the tiller of a row-boat, and from a somewhat different aspect in the "stand easy" of the military formula. In the inevitable ill-effects that follow dependence upon the ligaments we are strongly reminded that there is a meaning in that amount of contraction of muscles which exists in us all save when we are asleep, and which is known as muscle tone. The sole method in which man is intended to rest, apart from sleep, is by utilising the attraction of the earth for his members in such a way that no ligament is unduly put upon the stretch, and no muscle or set of muscles encouraged to undue relaxation. The carriage of the head and body which is so admired in those Eastern maidens who are accustomed to bearing

their laden pitcher from the well balanced upon their heads, depends upon just such an appreciation of the benefits attainable by a wise combination of the mechanical action of the weight, directed by a combination of muscular and gravitational forces: it is undoubtedly the method most parsimonious of energy and is naturally accompanied by those appeals to our consciousness which we have labelled æsthetic.

This question of beauty recalls the attitude of woman which throughout the centuries has made greatest appeal to humanity, an attitude which is being rapidly displaced, and a change which has its laudators. But, though the poetic picture of the dauntless "breast-forward" defiance of life's sterner moods has its recommendations—as possibly may have that of the chin-uplifted Gibson girl—we have preferred previously to this convexity of position that curve in statue or picture with slight concavity forwards. The statement will meet, of course, with a welcome derision, but the natural pose of woman is that which suggests receptivity, and is not that absolute erectness, much less the brazen convexity, which an alteration in the shape of the pelvis caused by modern athleticism will undoubtedly produce—along with its admirers. That this may not be misunderstood, it may be added that there is no demand in this to return to the clinging, fainting, ivyleaf, and other timeworn similes of not so long ago, but merely the unbiassed expression that the natural attitude of the erect female figure when depending upon only muscle tone is that which suggests a slightly retiring curve. It is indeed the only poise that can make beautiful the most healthy and normally built woman, when form and curves alone are considered as they shape a living vessel.

It is a commonplace of knowledge that, by a deliberately assumed position, it is possible to induce a definite con-

dition of the brain and higher centres: the universal method of wooing sleep is witness to this, and it has long been a stock joke of the popular Press that for a man to feel cheerful he has only to smile determinedly and persistently. Joke or not, there is some physiological basis for it. It is one of the laws of psychology that conduction in nerves is always forward, which means that, though a sensation may produce a definite muscular action, the repetition of the muscular action need not produce the precedent sensation. For the same reason it happens that when one has learnt, say, the Lord's Prayer by heart in one direction, he will still be unable to repeat it in the other. But though this law holds fairly true, it is a fact in psychical processes that, when a thing has been learned in one way, it requires less effort to learn it in the reverse order than if this latter were attacked quite *de novo*. There seems to be an escape of nervous energy which tends to link up the consequent to its antecedents as well as that in the reverse and normal direction which runs from the antecedent to what follows.

So that while an unpleasant state of mind results in frowning, it has now come to be quite explicable that, while frowning will lead to no absolutely definite condition of bad temper, it will yet by the connections which have been established—in a score of ways and on hundreds of different occasions—with those muscles engaged in frowning, succeed in a linking (by a slight reverse-direction flow) of various areas from which actually spring the stimuli to bad temper. The result is the establishment of an irritability very ready to increase upon small occasions. In addition, it must be remembered that, from a muscle in a state of contraction, there are steadily proceeding impulses derived from the stimulation so obtained of the sensory nerves contained in it, and that

such continual stimulation must come to be of the nature of an irritant, in the same way as any stimulant when too greatly prolonged ceases to be agreeable and becomes decidedly the reverse. That objection, it is true, might also be urged against smiling, and undoubtedly many society ladies could inform us of the strain this entails, but in the pleasanter aspects of the face there is little, or rather considerably less, definite muscular action involved : it is to some extent a relaxation of muscles, assisted of course by contractions on the part of others. Persistent smiling is, then, not so irritating to the individual himself as is continual scowling, but Shakespeare's addendum is still to be remembered that "one may smile and smile and be a villain."

Perfect poise and balance of all the parts of the body indicates an equal readiness and ability of all the muscles to contract, and while, for purposes of work or play, certain positions, connoting of course definite contractions of certain muscular groups, are found to possess advantages for the special function in view, it must not be forgotten that the power of complete inhibition of all contraction is a useful asset, and one which, perhaps, more than anything else proves bodily control to be complete—naturally so if inhibition is any test of evolution. The miraculous escapes of children who fall downstairs, or out of their high perambulators, affords evidence of the usefulness upon occasion of muscular relaxation ; though in their case it is not a result of inhibition, but due to that lack of the so-called instinct which mistakenly prompts people to brace themselves stiffly against the evil effects they so promptly anticipate. The notorious comparative immunity of drunkards from death by accidents is ascribable to a similar volitionless flaccidity. But from the latter and the children may thus be learned the useful lesson of leaving the body to take care of itself during falls. The

Rugby player learns it in part, and no one who has the ability to sleep at a moment's notice would have much difficulty in acquiring the art. It is of course understood that a certain amount of judgment is assumed as to when it will be advisable to use such a faculty.

Such deformities as knock-knees, bow-legs, and their kindred scarcely belong to this subject, since, though they may undoubtedly be caused by attempts to assume too early the positions of walking and standing in some cases, they are complicated by the existence of rickets in the majority of instances. It may be well to note, however, that the limbs of a quite normal child, as readily as its backbone, are quite susceptible to deformity if strain is brought to bear upon them too early. With the young child, then, care as regards the position it is permitted to assume should begin, and this in the direction of prevention of a premature sitting, standing, or walking. The school age, which wickedly at present begins at five years, should not be distinguished by too much sitting, and the habit of this must be diminished as far as possible in all ages. All positions are to be avoided which interfere with the symmetry of the two sides of the body: there is already a quite sufficiently marked preponderance of the importance of the left side of the brain in most of us, and it is not desirable to carry this onesidedness too far.

It must be remembered that position is the muscular reflection of a central nervous condition, and that the formation of preferences for special positions connotes a habit in nerve cells. This matter, bearing as it does upon the advantages and disadvantages of habit, must be referred to the section dealing with this. Here, however, it may be pointed out that the fewer the stereotyped positions that are formed, the more amenable is the body to fresh groupings and co-ordinations of its muscles, and the more flexible and responsive will be the whole body to

any new demands that may be made upon its various motilities.

The absolute necessity of the modern man to read, and the growing expensiveness of portions of space and the lessened availability of these complicate the question, but it should again be pointed out that the position for the resting body, in order that the ligaments may be preserved, is the recumbent one, and of this the heart will more slowly beat its approval.

CHAPTER XVI

HABIT

No voyage but follows definite paths—No nerve impulse but follows well-coursed nervous lines—Development—Our brain is in danger of forgetting its beginnings—Movement the test of conduct—The reflex arc our basis—No simple example—Derivation of reflexes from volitional movements.

Habit.—The memory of body-cells—Its extent—Dangers in individualism.

Levels.—Reflex, sensation and association—Habit is made possible in the highest level—Automatic action cannot become reflex—Reflex and sensory levels are laid down before birth—A few instinctive paths are blazed in the association areas—Compensation in man by ability to form habits—The physical basis of habit depends upon a cement—Habit spares energy and permits of accurate reduplication of movements—Danger of circumscription and narrowness—Easier to acquire new than to break old—Habits mean neither skill nor rightness—These require precaution—Habits like scratching the head.

Practical Applications.—In children—Sleep—"Original sin"—Instincts may be allowed to lapse—Habits of thought were expressed in Spencer's Essay on Education—The value of heresy and fads—"Man, know thyself!"

BETWEEN the thousand millions of the earth's inhabitants interchange of commodities and ideas on broad lines has been made possible by trade routes. At first mere paths in desert, jungle, or mountain, or the single furrows of isolated keels on lake, river, or sea have been all that connected tribe to tribe, village to village, and people to people. But as human portage gave way before the ampler loads of animals, and as tracks became

paths and roads and highways, and the "swan paths" of Norsemen and Viking grew to vessel and trade routes, the lines of worldly intercommunication hardened, defined, and became permanent, till to-day there is not a spot on earth, not excepting the Poles, towards which a journey must not at first proceed on clearly laid lines.

It is not so very difficult to trace the order and the means by which it has been made possible to launch a *Dreadnought* back to its primitive beginnings in accidentally floating log, early coracle and neolithic war-craft. There is more difficulty in understanding that the brain which could evolve the immortality of "trailing clouds of glory" was only made possible by the fixing of nervous routes, which began first of all with the vaguest and blindest of reactions to all stimuli, that of light included, but by such base degrees have we truly ascended. No impulse or stimulus can reach the body but its path is already mapped out for it among the lower nervous centres.

When the first amœba, with helplessly outflowing processes, first retracted one of them from the particle that threatened death, it then initiated a variation which later became a "tactual sense," and which to-day, by æonic development, has furnished us with brain and all the possibilities of soul, intellect, and habit.

First a mere flowing towards or from, with no apparent differentiation of substance, as in the amœba: from the one-celled organism to one made up of many cells, of which some are specially designed for nervous and muscular functions, as in the Cœlenterata; in Hydra separate, nervous cells; in sea-anemones superficial sensory cells connected with underlying nerve cells, and from these fibres which pass to contractile elements. This is a chronological chain of which every stage may be observed in the world even now. In higher animals the superficial

sensitive cells evolve till they become the organs of sense ; the underlying nerve cells become the ganglia and the central nervous system ; the contractile elements become muscles, while the interconnecting fibres have grown into nerves.

The brain of man is the direct descendant of the primal sensitive superficial cell : it is directly related with his skin, and there is a stage in the development of the human embryo when the cells which are the antecedent of the brain may be seen separating from the foetal skin. This shows, from the side of development, how close is the connection between the two, and will help to make clear how mind—the product of superficial cells which have passed inwards—is not, after all, so far removed from the activities of those cells which form the skin ; and, further, why it is that man is entirely dependent upon his environment, and cannot be either bodily or mentally self-sufficient. All his life, mind and soul arise from impulses sent from his surface to organs which are derived from the surface.

As a result, however, of secularly established mechanisms for sparing the “higher” centres, there is danger of forgetting that these do not stand alone ; and on account of so large a part of bodily life consisting of what we have come to term almost contemptuously “reflexes,” “instincts,” and “habits,” there is need to remind ourselves that these differ only in position and not in kind from activities, which are considered more worthy themes of consciousness.

The test of all morality and ethics is, in the last analysis, conduct, and the fundamental of conduct is movement, which itself depends upon a neuro-muscular equipment, so that very evidently the basis on which to start is the simplest form of the latter, and in the “reflex arc” consisting of sensitive cell and fibre communicating with

an internal cell which transmits the message received to another fibre attached to muscle, is comprised the physiological unit—unit of function or process. By the enormous elaboration and complication of human processes it is, however, impossible to find in the body an example of so primary a form of this unit, and the nearest approach to it, in even the most reflex of mechanisms, is complicated by the introduction of several relays of cells and fibres ; so that in such a seemingly elementary reflex as winking, which is the quickest human reflex known—occurring in twentieths of a second—there are many sensitive cells fibres, motor fibres, and muscular strands involved.

On such authority as that of Wundt we are asked to believe that winking was primarily a volitional impulse, which then became stereotyped in the "memory" of the cells concerned as a result of the frequency of their employment in one special fashion ; that this frequency of employment resulted in "habit" where volition is more spontaneous, and that from this to the elimination of consciousness and of other volitions than those of the cells engaged—to the formation of a "reflex," in fact—was a quite comprehensible step. We are further asked to believe that all reflexes have originated in this fashion. Certainly this process of the consciously difficult becoming a habit and finally an apparent reflex may be observed in the lives of every one, whether or not the inference be made universal in its application.

The beginner at billiards is hampered by the length of his cue : he strikes extraordinary attitudes in order to get his eye as near the level of the table as possible ; he finds his elbow in the way ; has difficulty in making an efficient "bridge" ; probably finds that he is overbalanced by an awkward position of legs and feet ; and finally, with the tip of the cue only an inch or so from the ball, may actually miss it altogether by the clumsiness of his stroke. Yet

the same man will a few months later screw a difficult shot into a pocket as a result of habits which have become automatic, though the chances are that if he be asked to tell precisely the different mechanisms he has so easily co-ordinated he will omit three-quarters of them. The same process may be noticed in the pianist or typist who can execute a complicated series of digital movements and at the same time talk of totally different matters.

Habit, then, it is not too much to admit, is "the memory of the body," and is of excellent service in saving conscious memory. It is the correlate in the nervous centres of repeated action, while the nearest approach to it in muscles and nerves is "practice," which, however, results in only an increased and facilitated blood-supply to them. But while so far as cells are concerned there is neither good nor bad, but the simple performance of any work to which they are called, the effect of their actions has to be judged by its influence on that immense co-operative society—the body; and in view of the extraordinary ability of the cells to remember, it has to be seen to that these memories, where they are controllable, shall be of the kind best calculated to help man's progress towards the stars: "our acts our angels are, or good or ill." Over habits then, and their offspring reflexes, there is need for great circumspection—the soul is their mirror.

It is indeed necessary that we should begin to examine the worth of our habits when we realise the extent to which our daily life is dominated by these or by custom, which is simply the habit of the community to which we belong. "Habit is second nature," said Montaigne; "How use doth breed a habit in a man," said Shakespeare, but it remained for Spencer to bring this truth home to us in our daily lives. For, as he pointed out thirty years ago, our hours of business are still established by the custom of our fellows, and our meals are fitted similarly to corre-

spond ; our intercourse with friends must be obtained at the times adopted by every one else. Still also the coming of age of grouse affects *our* comings and goings since, now as then, this important event determines the prorogation of Parliament, the London season, and our holidays, which latter in their turn react on the various arrangements for the rest of the year. The influence of custom, till quite recently at all events, in determining the common view of teetotalism and other "fads" was very marked.

The tendency at present seems, however, to be in the opposite direction, and there is danger that, in the general subversion which is threatened, not only habits, but reflexes also, may be overruled. Individualism is very well, but it must be clearly understood that there are limits to individualism, and that these limits are very clearly written in the physiology and anatomy of the human body.

As examples of the evil effects that may follow the power to inhibit reflexes may be recollected the control of the evacuant tendencies of the alimentary tract as well as that over the sexual mechanism. To the undue exercise of the first of these is attributable a growing proportion of so-called nervous and other troubles, while from the second is derived that increasing and unnatural class of spinsters and bachelors.

For convenience the nervous material of the body is divided into three levels: the first, which regulates the pure reflex movements of all kinds, these of course being all unaccompanied normally by any sensation ; the second level, in which sensation is superadded, and the third level, comprising the great association areas of the brain, which by its synthesis of the activities of the lower levels accounts for habit consciousness and all the phenomena of mentality. To the great development of the masses of

nerve cells and fibres which are concerned with grouping the elements derived from the lower levels is attributable the greater mass of brain in man as compared with the lower animals, and it is extremely important to note that, according to Flechsig, certain of these associational fibres are not perfected till adult life has been reached. Upon the use made of the third level depend all the acquirements of man, and Milton phrases the possibilities incomparably in describing man as "sufficient to have stood, though free to fall."

Habit, it has been said, is made possible in the highest level, and though reflexes may have begun similarly in the history of the race, it is not possible for any action, however automatic, to become a reflex in the life of the individual. Club-swinging may be taken as an example, or knitting, or, even better, speaking. All the muscles concerned with speaking have their nervous elements in the lower levels: they are simply called into play by the upper. Yet if this higher centre—which in all of us who are right-handed is situated in a small left-sided brain fold called Broca's convolution—be destroyed (as happens frequently in apoplexy), speech is at once impossible.

Reflexes are concerned with the life of the organism as a whole: this is why they make no appeal to consciousness, for no perfectly conscious movement can be perfectly and continuously rhythmical, as is needed in the beat of the heart, the movement of the lungs or the secretions of the body juices concerned with digestion, or the regular movements of the stomach and bowels. These are mechanisms which do not require to be taught their business, and which fortunately we can influence only indirectly. They with their organs form what is most deeply "natural" within us, and may safely be left to do what is best for us if we do what is best for ourselves.

The case is very different should we transgress, for then as Daniel says :—

“Nature all out of course to check our course
Neglects her work to work in us remorse.”

That, however, does not apply to the healthy, who require simply to be advised to leave these matters alone.

All the nerve cells and paths of the reflex and sensory levels are well and truly laid when the child is born. A few tracts in the higher levels concerned with instincts are also fully developed, but the vast forests of cells and fibres of the association areas, apart from the trails blazed by the instincts, are virgin.

When the new-hatched chick, fluttering among the fragments of shell from which it has just emerged, promptly pecks at a seed hard by, it is using one of its paths of congenital perceptual activities. The retinal image of the seed has stirred association fibres after arriving at the brain ; these fibres are connected with the cells governing nerves to the muscles of head, neck, and beak, and the result of the entrance of special rays of light is “pecking.” The path which the light stimulus took was not from anything in the shape of “choice” : it went there because it was the easiest path. Later it may take one of a score and lead to flight, cackling, scratching, upbraiding, and a dozen more, but the first necessity of the chick is food, and the practice of its past ancestors has made it easy for this food to be recognised, partially at least, and utilised. This action is not a pure reflex, since it implies perception—an attribute belonging to higher levels. It is, however, the type of instinctive response, and may be compared with the instincts of youthful man. There is little question of the value of such instincts in animals, and before man endeavours to lay similar easily working paths by means of the formation of habits,

the value of the habit proposed or likely to be acquired must be carefully examined. For "a slave to habit" is not a mere phrase and nothing more. It indicates an actual change in the structure of the brain, which after a certain time, and particularly after a certain age, can hardly be removed, since it is dependent upon permanent alterations in nervous tissues.

The brain consists of anything over six hundred millions of cells of all sizes and shapes, each of these possessing innumerable branching filaments or fibres, by means of which it is brought into the closest possible connection with others, though actual contact is never made. The intervening space, naturally of the minutest possible dimensions, is filled by a homogeneous jelly of which we know nothing more than its properties. This it is that resists most vigorously the communication of cell with cell, or fibre with cell, or fibre with fibre: it is the part of the nervous system which is most susceptible to fatigue and every other harmful influence; but when once a bridge has been made by the passage of an impulse over any part of it, the memory of this remains, or the actual structure of its material is so altered that all future passage is facilitated. To this, then, we have come—that in the properties of a cell cement have to be discerned the characteristics which make possible the formation of habit. Decidedly here it is the first step which costs.

The Indian-club swinger had sufficient trouble, and conscious trouble, to break down the resistances of cell connections in order to make his first easy movements, but with each repetition of these the resistance grew steadily less, till his movements could become automatic, no appeal to attention being necessary to ensure them nor even to facilitate them. Since the cell junctions, or *synapses*, are those parts which will first show fatigue, it becomes evident that if movements are limited to systems where

these junctions are broad and easy, fatigue may become an extraordinarily delayed phenomenon, so that here is the explanation of those feats of club-swinging which have been persisted in for even twelve hours at a time.

In the sparing of fatigue to the organism lies a prime justification of the value of habit, and in the possibility connected with it of almost exactly reduplicating the force and scope of any habitual process is another argument in its favour. Compare one beat of the heart with another under the same circumstances: could such exactitude of strength and time be reduplicated by a conscious operation? It will be found that, whenever it is necessary for man, woman, or child to make the same motion hundreds of times in succession, their precision will depend largely upon the extent to which volition is left out of the matter. Every one knows the sensation of freedom in cases where he simply "lets himself go," and when, as the saying runs, "everything comes off." This means that things are being left to the memory of the cells, and these for a given stimulus will give (other things being equal, of course) a given result. Habit, once formed, means the capacity to reproduce exactly similar results with the minimum of fatigue.

It should scarcely be necessary to apply this lesson more topically to the needs of everyday life: examples are so obvious. The beginning of the day is the time to begin a proper appreciation. For if, at the sound of warning maid, man, or alarm, the habit has been formed of connecting the auditory response to this stimulus, in the second level, through the proper association fibres to those motor areas near the Rolandic fissure which co-ordinate the movement of the arms, legs, and body in impulses passing to the muscles concerned with throwing back the clothes and swinging oneself out of bed—then the day has begun without exertion or drain on that energy which will

be all required for other purposes. This utilisation of an automatic action, with its consequent preservation of the more easily fatigued synapses, amounts indeed to a start over a less well-trained neighbour in the race of life. The preservation of, or economy in using, mental energy may be summed in the advice to "guard your synapses."

One good yawn, the benison for a pleasant night, is permissible—even more, desirable. By it the lungs are well expanded; the stagnant air, engendered in recesses by the diminished activity of the nocturnal respiratory movements, is assisted to depart; the heart is at once stimulated to the taking up of a more vigorous *régime*, and the extensor muscles are contracted vigorously by the "stretching" that usually accompanies the yawning. This stretching may be noticed in any animal after it has been resting, and is enforced if the extensors are to be brought into their normal position of "tone." The flexor muscles are by far the more powerful groups; and during all rest the position of greatest ease is one in which the flexors maintain most approximately their position, to the detriment, however, of the opposing groups, which must be fully relaxed in consequence. To take up this amount of relaxation is the function of the morning stretch.

I do not mean to limit the advantages of habit to merely muscular mechanisms; what has been stated regarding these applies with equal force to every realm of mental and moral activity. The same materials are involved. Nerve cell, nerve fibre, and nerve synapse—these are the essentials. Primarily the outlet of all nervous energy was movement of muscles, and this early trait is well exemplified by the reflex levels; later, part of the energy liberated by any stimulus became dissipated in provoking that reaction we call sensation, but along with this the visible muscular reaction still predominated; but, as level after level of nervous material evolved, clearly there was

possible a greater and ever-increasing dissipation of energy, without the outward tangible muscular response being required as before to account for most of it. Thus now an indignation or nervous storm may utilise, or burn, all that it once required the muscular wielding of axe or sword to exhaust. The most vigorous wave of external stimulation can be dissipated as the rippling of a million brain cells in the man of vigorously exercised brain.

By habit is undoubtedly guaranteed that any given stimulus shall not have its energy wasted, since ready outlets for it are ensured with a minimum of exertion. But in this very accessibility lies a danger, since any stimulus, instead of going its proper way, may prefer the beaten track already laid. Habits of thought have, therefore, their menace in the shape of limitation or narrowness; while, as the natural converse, those who have built up none or few of such habits are likely to possess a livelier imagination, since the arriving energy is free to travel anywhere among the association fibres and can thus combine a greater complex of visual, auditory, and other memories. It is sufficiently plain that the gain in breadth of insight is likely to be compensated for by a loss of intensity or force—a fact which will account for imagination and practicality being seldom combined. When such a combination is found we at least know its designation—genius.

In this danger, then, of habits of action as well as thought being too liable to cause limitation in the corresponding nervous areas lies an obvious offset to its advantages, and there is more in this point than only the ready accessibility of the well-trodden paths of thought or action. It is the case, when any such system is well established, that it tends to isolate itself, by making communication with other cortical areas even more difficult than is accounted for by the natural resistance of the

synapses. A greater effort, therefore, is necessary to break down the barriers of habit than is necessary to take the first step in acquiring a quite new one; and of this the moral is clear: it is utilised in the treatment of those habits which have become so firmly rooted as to be obsessions. Dipsomaniacs are encouraged to play golf. In the same direction lies the universally prescribed change of scene for so many ailments. It is easier to weaken by sapping than by direct attack, and the undesirable paths of habit are as readily overgrown and encumbered once more by the original resistances as are those forest paths which served us for metaphor.

The reflexes of the body are to be trusted, and so are the sensations; instincts in the case of man are so overlaid by the acquirements obtained by the use of associations that they are hardly to be recognised. The emotions, very different in derivation and complexity from the sensations, are never to be accepted blindfold, while all habits require to be as carefully scrutinised, and the extent to which they have been permitted to monopolise brain stimuli frequently considered.

There is no *necessary* connection between the ease of habit and skill; such connection has to be enforced by a most scrupulous attention to the first steps; without such attention habit, as readily understood from its tendency to conservative circumscription, may be an absolute disadvantage. It is usually easier to train a beginner, and only a C. B. Fry can remodel his batting style after he has once made his century.

In the disadvantages of habit may be found all that can be urged against specialism of any kind, or indeed fanaticism, which is an advanced form of specialism—and it should be the concern of every one to test whether the synapses surrounding the brain area that is most involved with his predominant work or thought, are readily

accessible to suggestions from other apparently disconnected regions of mental activity. I am loth to quote again, but for vivid illustration of the kinship between mental processes and perceptions no scientific Dryasdust is likely to rival such poetic vision of underlying harmonies as is contained in the phrase

"The meanest flower that blows can give
Thoughts that do often lie too deep for tears."

There are certain habits, common to every man, which, though apparently useless and sometimes even foolish, are in reality deep-rooted in the processes of physiology. The puzzled ploughman scratching his bewildered head is usually an object of ridicule, but there is more than a likeness between him and the cultured man of intellect who, with fingers pressed to his brow, is endeavouring to disentangle the meaning of some obscure writer. Each is pressing upon some branch of his fifth cranial nerve in his search for enlightenment, and the explanation of such an action is that this fifth nerve, when stimulated, floods the brain with an increased supply of arterial blood. Any sensory nerve will act in the same fashion, but the fifth is usually chosen on account of its connection with head and face and the readiness of access to it at all times and places. The lesson of the last paragraph is that, before it is possible for any one to decide definitely as to whether any particular habit is useless, harmful, or beneficial, a fairly wide knowledge of physiology is necessary.

Naturally the first practical application of the value of habit should be made in the case of children. The infant must acquire the habit of taking its meals of the proper quantity at the proper hours of day and night, but at this tender age this is almost all that can be done. The reflex action of the muscles which control the bladder and rectum

will suffice to attend to these primary necessities of the young animal.

But when the child attains the age at which speech begins to be understood, then must also begin that training of which the fullest adult life is the amplest reflection—the education in the habit of inhibition. This inhibition, meaning “preventing” or “willing not to,” is, by a curious paradox, the supreme manifestation of the will. It is the controller of tendencies, and is the habit to which every one who wishes to rank with other than the animals must give devoted allegiance.

Not for a moment is it declared that all natural impulses or reflexes must be always inhibited. We have no desire to be enrolled among the prophets or even with St. Paul, but the power to say “No” is the priceless heritage of man, and the judicious use of this power the criterion of his evolutionary status; just as at a very early age it is needful for the child to be able to resist the inconvenient calls of nature, so the power of restraint thus begun will pervade its whole history.

Sleep, similarly, or the total inhibition of bodily activities, may as readily become a habit, the value of which cannot be exaggerated, while along with these trainings will naturally be acquired the habit of obedience. No demands on this score of docility should, however, be allowed to check the bodily activities of young children. This is a point which is considered under “Exercise.” Interference with the reflexes which prompt a child’s limbs and body to movements is bound to do harm, as is indeed any checking of the reflexes concerned with excretion—unless, for these, times are appointed at regular and desirable intervals. The waste of a child’s energy requires outlet as surely as do the waste products of its food and body.

With the age of speech begins the ability to manifest “original sin,” which is by no means a pure reflex, but a

condition well within the cognisance of the child's consciousness. It is a feature which without question partakes of the nature of instinct, inasmuch as it is made possible by early developed cortical areas and potential paths; but, differently from the ages and states in which instincts are admissible, there are at this age other areas of the brain quite capable of cultivation, and it must be the concern of the parents or friends to give these other more desirable regions their fair chance, for only so can the almost instinctive barbarities of youth be nullified. A profound scientific truth is excellently expressed in the popular adage regarding the willingness of Satan to find work for empty hands, and the implication is particularly effective regarding the benefit of suitable amusement or employment for such hands. This is a good example of the possibility of inhibition by drainage, since with one brain area active there is a natural diversion of all other brain energies to that part. A fuller recognition of this truth would serve not only to keep latent the more brutal fighting tendencies, but might possibly act widely upon the community so as to eliminate the senseless habit of war.

While it is the desire of a rational physiological treatment of the body to maintain the full powers of the pure reflexes and sensations, subject only to certain conditions of control in time and space, it is not at all necessary that even one of the instincts pure or mixed should survive, since the place of these is quite competently filled by the enormous variety of acquirements made possible to man by his powers of perception and consciousness. Instincts are only really serviceable to animals and the irrational man. Since, however, in him the nervous organisation which causes instincts is on the same level as that which conditions his higher acquirements, the two are able to blend in unsuspected ways and not always with advantage. It is probably best that the instincts, along with the rest of

the beast within us, should be allowed to lapse. Instinct has been too long overlaid in man for it to be essential to human life.

During the school period are initiated the habits of work and of a more restricted exercise—a training in acquirements which from the commencement should be based on what is known of the body, and with an eye to what is best—not most useful or most recognised in the popular sense—for the future man; and at this stage above all should be encouraged the habit of thought which means the opening up and keeping open of the widest possible channels of brain-cell communication. The special training for such habit of thought has its best expression in an essay upon education by Herbert Spencer, written some forty-five years ago. Till Spencer's principles have been accepted there is no need to elaborate their application. But it is significant that a system of Board School education, in which such principles have been conspicuously absent, has been in vogue for a time practically equal to that during which this essay has been in our hands, and that this system has been a failure the magnitude of which we are only beginning to comprehend.

The reception of various light rays from a printed page does not constitute that reading which Bacon declared to make "a full man," and here is a universal habit that demands the attention of all who read.

Into the realms of religion, patriotism, municipal life, business, amusement, and household affairs, habit, in the guise of dogma, creed, bias or so-called "principles," has insinuated itself to the extent of possessing actual supremacy. There is reason to appreciate the Nonconformists, the heretics, the cranks, and the faddists of all degrees, since, though their rebellion is frequently on only one point, they express, however imperfectly, the right to free intercourse between brain cells and areas. Their action is

a revolt of the association areas against protection and unfair monopoly by habits.

Habits, then, are of value for conserving energy in those processes where active thought would retard efficiency of performance ; they are a danger when, from any combination of causes, they interfere with the power of fully utilising all the faculties within us upon which a late evolution has set the seal of approval.

The value of a knowledge of the physiological basis of habit to those of riper years lies in the clearness of its testimony as regards the effect of the first step ; since the second step is always easier and so on in a series of steadily decreasing difficulty, till the difficulty, in fact, consists in avoiding the passage of impulses towards that particular action, it is very evident that the first step in any reprehensible direction is the step which should not be taken. There is little need to apply this dictum too closely. Alcohol and tobacco naturally suggest themselves, but to each man his own vice and corresponding temptation. To each man, therefore, applies, as it has always done to every man in every time, the magnificent aphorism of Thales, " Man, know thyself ! "

CHAPTER XVII

THE FUNCTION OF THE PHYSICIAN

Chinese fables—One of them worthy of consideration—Medicine should be preventive—The change rests with the public—The opinion of the general practitioner himself—Diathesis—Occupation and other data from which may be derived suggestions regarding the conduct of life—The diagnosis of perfect “fitness” more difficult than that of marked disease—Why?—A quarterly medical inspection should be the minimum—Present method of paying doctors forms the obstacle—Suggested percentage on income as assurance for health or against doctor’s bills—Fallacy of present method—Greater recognition of doctors by the State and protection against quackery needed.

WE are amused at various times by tales of the customs prevalent in China in regard to the Chinese use of doctors—China usually, probably because it is sufficiently far away for the fear of contradiction to be equally remote. One day we are told that the Chinese doctor is allowed to feel only the pulse of the patient, which is presented to him through an intervening curtain, and that from this pulse the diagnosis must be made—though this, if it be so, is not so wonderful as it may sound, and certain modern professors of medicine would hardly feel handicapped by similar conditions, to judge by the amount of information they insist upon their students deriving from this source, with the assistance, of course, of the sphygmograph. Again, it is stated that the physicians to the Royal House

of China are paid handsome salaries so long as their august patients remain in health, but run some risk of being beheaded if illness is allowed to supervene: or still again, that these Chinese doctors are paid for keeping people well, and are forced to attend them gratis when ill. Whether it be fact or fiction, in the last of these methods is much sound sense. The function of medicine and medical knowledge should above all be preventive, and there is now sufficient information in the hands of the profession for it to prefer to adopt this *role* rather than that of cure. The date upon which this change shall be completely made from the present unsatisfactory procedure rests altogether with the public, and so the public must realise.

Already there are sufficiently striking indications of the tendency to seek advice before a possibility of illness, rather than to await its occurrence; and in the appointment of sanitary inspectors, medical inspectors of schools, and medical officers of health for cities and boroughs, some progress has already been made towards the ideal condition. But the function of the doctors is still, so far as nine-tenths of them are concerned, the treatment of disease that should not have been allowed to occur.

It will, perhaps, best indicate the extent to which the practitioner considers he is entitled to a voice, and that the deciding voice, in matters which have not so far been left to his decision, if I extract from a leading article which appeared in the *General Practitioner*: "Till recently our children went to school at an age when the most general of general practitioners could have stated that the greatest harm would ensue; till recently, disease was supposed to be an act of Providence, and night air poisonous; while even now there lingers more than a belief in the efficacy of arbitrary punishments in lessening the occurrence of crime; and only now is it beginning

to percolate to the non-medical laity that morality in the majority of cases depends upon environment." Very evidently the family doctor realises his own capacities, and it will be to the advantage of the public to demand a stricter account of such talents.

There is a term which is much in favour with medical men, but of which those principally concerned hear little: that is the word "diathesis." Yet it is of an import which concerns a quite considerable section of the community. It indicates that there is something in the conformation, physique, or appearance of the individual, or some fact in his family history or heredity, which suggests a predisposition to the onslaught of some particular disease. Hence the usual adjectives before this term are "tubercular," "rheumatic," and "gouty"—to name the commonest. What is there in the much-vaunted claims of astrology, palmistry, or clairvoyance which can compare with this power of prediction which the doctor treats as a commonplace? From the diathesis it is at once possible to advise any individual possessing it on the mode of life he should follow, and of those diseases which are most likely to trouble him—a very evident illustration of how from evil may be obtained some good.

From the occupation, as much as from the diathesis, the doctor is often able to predicate future troubles with great precision, and if, in addition to the foregoing, he be told the facts regarding environment at work and play, and the habits as to sleep, exercise, and so on, the information that he can then place at the disposal of the inquirer concerning the probable risks hidden in the future is quite well worthy to guide the life-conduct of any thinking man. If there be added statements regarding accidents and past illnesses, with a suggestion or two upon the health of other members of the family, the "history" is complete. There is meaning in every question asked of

the patients in the great general hospitals, though they may sometimes wonder why, when they complain of shooting pains for instance, they should be asked if they have ever lived abroad, or other apparently irrelevant question.

The information to be gained by questioning is considerable, as is also that obtained from mere inspection and such elementary processes as counting the respirations and feeling the pulse ; and in many actually present ailments there is little need to go further, though an unreasoning public still insists upon seeing an "examination" made—which means that the stethoscope must be gravely produced and as gravely applied, &c. But it is much easier to diagnose well-marked disease than those actual states of being which represent full health in different individuals, if this has to be done at one interview.

For a doctor to know whether or not any man is "fit" it is essential for him to have much knowledge of that man acquired by previous examinations and personal acquaintance. A pulse beat of fifty in one individual may be perfectly normal, while in another it may indicate profound depression of the nervous system ; nor is it every one who knows the usual rate of his pulse. The most important time to go to a doctor is when health is as perfect as it can be, in order that then a record may be taken of every important system of the body, which may serve as standard in all future consultations.

A quarterly visit, *at least*, to the doctor should be an absolute rule, and would obviate many a serious illness. A timely investigation of the kidneys has again and again saved from apoplexy in the one class of patient, and from convulsions and death to both mother and child in another. It would be easy to multiply sensational examples, but it is desired rather to point out the value of such regular examinations—and their consequent information and suggestions—in the remedying of that

greater number of cases where, without any very definite ill-health, there is yet the threat of danger to follow, not necessarily at once, but inevitably, if life is not amended in possibly some quite trivial detail of its conduct. Worry, for instance, has usually a physical basis, as it lends itself also to physical cure.¹

If regular medical inspection of the State, of towns, and of schools is of value—and this, at least, has never been denied—then the same procedure must be of equal value in the home and life of the individual upon whom the State is built, and from whom the community is derived. By amending the present ridiculous method of paying doctors, this can be obtained without difficulty. Working men are well accustomed to paying into a sick fund for their individual benefit, and all that is required is an extension of the method to the nation generally. Decide upon a fair percentage of the income of each home, and let that be paid to the doctor chosen. He would thus receive a fair remuneration for services which no member of the general public is able to assess properly. For, by the present condition of things, the doctor who cuts short an attack of rheumatic fever in twenty-four hours and prevents any bad after-effects will probably receive one-twentieth of the money paid to the man who through incompetence, ignorance, or worse allows the case to drag on for the time-honoured six weeks, with the probable complication of heart disease at the end. In all justice the former should receive the greatest reward, yet most likely the latter, in addition to scoring financially, will acquire a reputation for his carefulness in “coming three times a day.” Rheumatic fever, too, has only been taken as type of many similar contingencies.

That fancy which in “China” seemed a jest is well

¹ See “Physical Cures of Worry” in “Worry: the Disease of the Age,” by C. W. Saleeby, M.D.

worth serious adoption. The doctor at present does not get a fair chance to do his best for his people. They come two or three days or two or three weeks after an event, because they "thought it would pass off," &c., and may cripple themselves for life by the lack of a knowledge they cannot be expected to possess. Often, however, the pecuniary is the reason for the apparent carelessness. Make it to the doctor's interest to keep the nation well—to his honour, be it said, that is his desire even now—and give him the right to superintend his own interests, as would be the case were he retained at the one yearly sum no matter what is registered by the barometer of sickness—it is safe to say that the infantile mortality would at once go down by half; that nurses, midwives, and so on, would rapidly attain a much higher standard of ability; that the habits and health of the children and of the nation would quickly improve and that physical deterioration would cease to be a question. It was Samuel Butler who sang—

"A skilful leech is better far
Than half an hundred men of war,"

but it remains for an age many generations after his to show that this knowledge is fully appreciated. Doubtless the time is arriving—for there are signs of it abroad—when the State which benefits by the labour of the physician will yet perceive the necessity of a fuller recognition and an ampler protection of his efforts in the so-called private as well as in a public capacity. That prescience which pretends to supervise the health of the whole while it almost ignores the health of the parts is of little value, but while this is not the place to enter upon the full discussion of the "care of the doctor," it may yet be pointed out that there are no quacks allowed as medical officers of health. What is the vital difference between the town and the people constituting it?

INDEX

A

Absorbent clothing, 126
 Acids in fatigue, 88, 89
 Accommodation, muscle of, 205
 Adenoids, 227
 Age limits, Greece, Rome, 87
 Air as warm layer, 100, 111
 „ night, 30
 Albinos, eye fatigue, 208
 Allbutt on games, 76
 Alcohol, 90
 Alkalies on skin, 128
 Alkalinity and fatigue, 89
 Alopecia, 146
 Amateur and professional, 71
 Ambergris and smell, 234
 American shoes, 176
 Amoeba and child compared, 56
 „ and tactility, 262
 Anabolism, feminine, 60
 Aneurism, 87
 Anointing, 131
 Anti-fat, 67
 Antiseptic soaps, 130
 Appetite, 65
 Arch of foot, 173, 174
 Aroma, 236
 Arsenic on skin, 140
 Arteries thickened, 85, 87, 145
 Artists and eyes, 211
 Athletics in Greece, 70
 „ and position, 254

Atrophy, 88

Auditory dreams, 224

„ perversions in insane, 218

Automatic action, 18, 267

„ movement, 269

B

Bacilli of colds, 52

„ of hair, 147

„ of nose, 234

„ odourless of disease, 235

„ of teeth, 162, 166

Baldness, 145

Ball games, 77, 78

Banting, 67

Bare heads, 109

„ knees, 104

Baths, 36

„ varieties of, 45

Beauty, 121

„ doctors, 93

„ sleep, 26

„ of poise, 256

Bed, airing the, 33

„ furniture of, 32

„ length and width, 32

„ position of, 31

Bedroom, 27

„ unventilated, 27

„ furniture of, 30

„ shape, 31

„ size, 29

Bedroom walls, &c., of, 30
 Bed-time, 25
 Bell's paralysis, 133
 Belts, 107
 Biliousness, 201
 Billiards, 264
 Bite of teeth, 169
 "Black-heads," 127, 141
 Blinds, 30
 Blisters, 182
 Blood in fatigue, 87
 Blowing the nose, 238
 Bostracing, 70
 Boots, shape of, 176
 ,, polishing, 113
 ,, trees, 180
 Bouquet, 236
 Braces, 117
 Brain activity unchecked, 17
 ,, cells, 13
 ,, cells and fatigue, 73
 ,, cell stimulants, 89
 ,, evolution, 263
 Bramall Lane, 76
 Breathing, mouth, 168
 ,, nose, 237
 Brilliantine, 153
 Brushing the hair, 152
 Brushes, military, 152
 Bunions, 177
 Butler, Samuel, on leeches, 284

C

Carbonic acid, 29
 Cambodian clothing, 108
 Cantlie and work, 67
 Caps, 109
 Carlyle, eyes, 200
 ,, noise, 221
 Carriage, good, 255
 Catarrhs and speech, 239
 ,, of nose, 239
 Cells, blood, 7, 14
 ,, brain, 13, 14, 269
 Cement, brain, 269
 Changing clothes, 101

Changing occupation, 89
 Chest protectors, 126
 Chick and instinct, 268
 Chilblains, 177
 Child and exercise, 56
 ,, is unmoral, 58
 Chinese fables, 279
 Chromophages, 150
 Cicero on massage, 94
 Ciliary muscle, 205
 Clayton's experiments, 190
 Clothing and clothes, 96
 ,, cheap, 119
 ,, evening, 115
 ,, as food saver, 98
 ,, functions of, 97
 ,, girls', 105
 ,, infants', 103
 ,, men's, 107
 ,, under-, 114
 ,, women's, 106
 Coats, 111
 Cold bath, 37
 ,, cream, 138
 ,, feet, 181
 ,, to the head, 149
 Cold, the common, 50
 Colds and deafness, 225
 Collars, 117
 Colour of hair, 150
 Combs, 155
 "Comforter," the, 160
 ,, catarrh and deafness, 225
 Complexion, 122, 136-7
 Conduct, the test of morality, 263
 Consciousness, due to resistance, 88
 Contraction of muscle, 78
 Corns, 177, 182
 ,, and bedsores, 93
 Corsets, 118
 Cosmetics, 139
 Coughing in church, 227
 Cramp, writers', 251
 Curtains, 30
 Cycling, 64

D

Dandruff, 153
 Danger of brain stimulation, 90
 Davies on deafness, 226
 Deafness, 219, 223
 ,, middle ear catarrh, 224
 ,, in school children, 226
 Decay of teeth, 164
 Deformities, 259
 Dental formulæ, 164
 Dentine, 166
 Dentist, visits to, 168
 Dentures, care of, 169
 Depilatories, 157
 Dermis, 123, 124
 Desks, 250
 Detachable cuffs, 115
 ,, linings in boots, 181
 ,, linings in gloves, 185
 ,, pockets, 114
 Deterioration, physical, 74
 Diathesis, 281
 Diet on complexion, 137
 "Disharmony" of eyes, 203
 Disraeli and tailor, 108
 Double chin, 141
 Douching for schools, 47
 Draughts and chills, 52
 Dreams, auditory, 224
 ,, hallucinations and, 21
 ,, Hamlet, Macbeth, on, 22
 ,, historical, 9, 10
 ,, indigestion and, 15
 ,, mesmerism and, 15
 ,, thieves and, 16
 ,, reflex, 15
 Dress, evening, 115
 Dressing-gowns, 74
 Dumb-bells, &c., 81
 Durable clothes, 119
 Dusky skin, 142
 Dyes, hair, 151
 "Dyspepsia," 200

E

Ears, 216
 Earlids, 221

Economy of clothes, 99
 Education, Spencer on, 277
 Ego, the, 16
 Elasticity of skin, 135
 Electrolysis, 141, 157
 Embonpoint, 141
 Enamel, tooth, 165
 Epidermis, 123
 Equilibration, 230
 Ergograph, 13
 Eton slouch, 246
 Eustachian tube, 224, 236
 Evening dress, 115
 Exercise, 53
 ,, various, 80
 Excitement, effect of, on fatigue, 89
 Expression, 133
 Eyes, 198
 ,, affections of, 199
 ,, and artists, 211
 ,, anæmia, jaundice, &c., 199
 ,, Carlyle, Darwin, De Quincey, &c., 200
 ,, relief of, 209
 ,, sleep and, 19, 20
 ,, statistics regarding, 202
 ,, treatment of, 211
 ,, tobacco and, 209
 Eye-strain and sleep, 20

F

Face, 132
 Facial hair, 156
 Fatigue, 11, 13, 87
 ,, eye, 206
 ,, products as cause of death, 87
 ,, retinal fatigue in museum, church, society, reading, pictures, &c., 206, 207
 Fats of soap, 129
 Feet, 172
 ,, English, 244
 ,, Chinese, 243
 Finger-prints, 124
 Finsen's blue rays, 189
 "Fire" in eyes, 215

Fitness, 7, 8
 „ and greyness, 145
 „ diagnosis of, 282
 Flammarion's experiments, 190
 Flat-foot, 252
 „ „ Kipps” and, 179
 Foes of man, 3
 Food taken, 65
 Follicles, hair, 146
 Football, 77
 “Form,” 73
 Freckles, 140, 191
 „ on hands, 186
 Freezing mixture necklace, 140
 Froude on Carlyle, 200
 Frowning, 135, 257

G

Galen to the gladiators, 74
 Games, 76
 Garters, 117
 Gilding the skin, 41
 Gladstone, on chewing, 171
 „ on cheap clothes, 119
 Gloves, 186
 Glycerine, 139
 Golf, &c., 77, 78
 Grace or “good form,” 253
 Grassois, the, 240
 Grecian athletics, 70
 Grey hair, 145
 Greyness, 150
 Growing pains, 104
 Gymnastics, 80

H

Habit, 261
 „ in children, 274-5
 „ dangers of, 272
 „ foolish, apparent, 274
 „ saves fatigue, 270
 „ Shakespeare, Spencer, Montaigne, &c., on, 265-6
 Hadrian on massage, 94
 Hair, 144

Hair in nostrils, 237
 „ in women, 154
 „ pins, 154
 „ pads, 154
 „ curling, crimping, &c., 154
 Haller and smell, 234
 Hallucinations, 19, 21, 214
 „ of smell, 241
 Hamilton on mind, 54
 Hammer-toe, 177
 Hands, 184
 „ surgical cleansing of, 131
 Handkerchiefs, 239
 “Hardening,” 105
 Hats, 108, 147
 „ women's, 109
 „ bowler, Panama, straw, top, &c., 109
 „ heat of various, 148
 Hawaiians and Lomi-Lomi, 94
 Hay fever, 240
 Headaches, 200
 Health, assurance and, 2
 „ Metchnikoff and, 2
 „ undefinable, 1
 Hearing, mechanism, 222-3
 „ and smell, 236
 Hedley, “dummy on teeth,” 161
 Heel of boots, 175
 „ as weight-bearer, 173
 Height depends on thigh-bone, 253
 Heresy, 277
 Hippocrates on rubbing, 91
 “History” of a patient, 281
 Homer and Herodicus on rubbing, 91
 Hot water on hands, 186
 Housewives' walking, 68
 Hunger, 65
 Hutchison on hair-dyes, 151
 Huxley and eyes, 200
 Hyperæmia of brain, 16, 17
 Hyperpyræmia, 102
 Hypnotism, 15
 Hypnotics, 33
 Hyslop and hearing, 218

I

Imbert, Professor, on X-rays and hair, 151
 Impressionists, 211
 Individualism, 266
 Ingrowing toe-nail, 177
 Inhibition, 258, 275
 " by drainage, 276
 Insomnia, 19
 " Broadbent on, 19
 " causes, 19, 34
 " dyspepsia and, 19
 " eye-strain and, 19
 " prevention of, 34
 Instinct, 268, 273, 277

J

Jackets, 111
 Jerseys, 112
 Joints, 185
 See also "Knee."
 John Bull, 66

K

Kilts, 104
 Knees, bare, 104
 Knickers, 112

L

Lancing the gums, 163
 Lasts for boots, 177
 Law of Dissolution, 11
 Layers of clothing, 100
 Leather, nothing like, 178
 " substitutes for, 183
 Lens, eye, 205
 Leucocytes, phagocytic, 7
 " stimulation of, 7
 Levels of nervous system, 266
 Liebermeister and heat-loss, 42
 Ligaments, dependence on, 245
 Light, 188
 Lighting, faulty, 208
 Light rays on slum children, 192
 "Lines" in hands, 124

U

Lips, 142
 Locomotion, 61, 62
 Lomi-Lomi, 94
 Lupus and light, 189
 Lymph, 92

M

Macrophages, 87
 Malaria, organism of, 4
 " eradicable, Why? 4
 " Ross and, 4
 Manicure, 187
 Massage, 91
 " of face, 136
 " mechanism, 95
 Mastication, 170
 Measuring for boots, 180
 Mechanism of massage, 95
 Medicated baths, 49
 Megrims, 201
 Milk teeth, 163
 Mesmerism, 16
 Mesmeric state, 206
 Metchnikoff on "Disharmony," 203
 " on hair and, 155
 " chromophages, 150
 " on life, 2
 Middle ear, 224
 Military brushes, 152
 Moonlight, 194
 Moustaches, &c., 156-7
 Mouth breathing, 168, 225
 " washes, 166
 Motive of book, 1
 Mud and peat baths, 49
 Muscle worship, 53
 " ciliary, 205
 " of eyes, 204-5
 " of hearing, 222
 " of locomotion, 61
 Muscular action in supporting arch of foot, 184
 " check to, 17
 " contractions as irritant, 257
 " relaxation, 258
 Music, 228

N

- Nails, 186
- Narrow boots, 177
- Nasal catarrh, 239
- Natural training, 72
- Nature, going back to, 61
- Nerve, exercise and, 54
- Nervous levels, 266
 - „ system, development of, 262
- Nightmare, 15
- Noise, 218, 219, 223
 - „ compared with alcohol, 220
- Nordall on red rays, 193
- Nose, the, 232
 - „ breathing, 25, 237
 - „ „ mechanism of, 238

O

- Obesity, 67, 145
- Occupation, 281
- Odor humanus*, the, 232
- Odourless bacilli, 235
- Oil on body, Pliny, 132
- Old age, Wendell Holmes, 135
- Olfactory irritation, 233
- Onesidedness, 248
- Ontogeny and phylogeny, 57
- Oral hygiene, 171
- Original sin, 276
- Overalls for workmen, 119
- Ozone, 195
 - „ tests for, 196
 - „ value of, 196
 - „ uselessness of, 196-7

P

- Paints, 139
- Palmistry, 124
- Panama hat, 149
- Paraffin for hair, 151
- Parasols, 141
 - „ colour, 186
- Parsimony of nature, 253
- Pastes, 139
- Pasteur and suppuration, 4
- Patent hair washes, 151
- Payment of doctors, 283

- Pelvic troubles by bad position, 247
- Penalties of prolonged position, 255
- Permanent teeth, 164
- Peroxide of hydrogen, 142
- Perspiration, 40
- Phagocytes, 7, 51, 150
- “Physical Culture,” 78
- Physiognomy, 133-4.
- Pianists, 252
- Pickwick, 66
- Pigment of hair, 144
- Pimples, 41, 141
- Plaster boot-trees, 180
- Platen on light, 192
- Play, 57, 77
- Plato on massage, 94
- Pliny on oil, 132
 - „ and Paracelsus on massage, 94

- Pockets, 114
- Poise, feminine, 256
 - „ value of, 258
- Pomades, 139
- Positions, good, 242, 254
 - „ in utero, &c., 243
 - „ change of, 249
- Potential energy, 65
- Powders, 138
 - „ tooth, 167
- Practice, 72, 73, 265
- Preventive medicine, 280
- “Principles,” 277
- Printing, various, 206
- Products of fatigue, 88
- Professional and amateur, 70
- Psychical research, 21
 - „ visions, 214
- Puberty, exercise, &c., at, 59
- Pugaree, 141

Q

- Quacks, 284
- Quincey, de, eyes of, 200

R

- Rays, blue, 189, 190
 - „ red, chemical, ultra-violet, and X-rays, 191

- Rays, red, Nordalt, 193
 „ X-, 151, 191
 Reflexes, Wundt on, 264
 „ function of, 267
 „ and sensory levels, 268
 Reid, Archdall, on exercise, 55
 Reserve of strength, 68
 Respiration, 64
 Rhythm, 10, 228
 Rickets and teeth, 163
 Rouge, 139
 Rubber appliances, 81
 Rubbing, 44, 74
 Running of nose, 238

 S
 Saleeby on worry, 283
 Scherl and high pavilions, 233
 Schofield and hypnotics, 33
 Scurf, 153
 Sea bathing, 47
 „ and colds, 48
 Sebaceous glands, 42
 Sebum, 126
 Shampoo, 153
 Shape of boots, 176
 Shirt, the white, 114
 Shoes, 183
 Singeing, 153
 Single muscle exercises, 78
 Sitting, 245-50
 Skill, not habit, 273
 Skin, 41, 121
 „ absorption, 40, 42
 „ functions of, 122
 „ damage to, 123
 Sleep, 9
 „ anæmia of brain and, 14
 „ beauty-, 26
 „ Cervantes and, 35
 „ Chiene on, 21
 „ climacterics and, 24
 „ continuous, 26
 „ Darwin, Acland, and Bevan
 Lewis on, 23
 „ dreaming and, 9
 Sleep, duration of, 23
 „ exceptional, 25
 „ hyperæmia on, 17
 „ intensity of, 24
 „ mesmerism and, 16
 „ refreshing, 10, 18
 „ rhythm and, 11
 „ time for, 26
 „ wooing of, 33
 Slouching, 246
 Smell, 232
 „ sensitiveness of, 234
 „ value in man, 235
 „ and association, 234
 „ in animals, 235
 „ and hearing, 236
 Smiling, 257
 Sneezing, 238
 Snuff, 239
 Soap, 127
 „ alkaline, medicated, and super-
 fatted, 128-30
 Sophocles on muscle, 55
 Specialism, 273
 Spectacles, 202, 213
 Spectrum, solar, 189
 Spencer on education, 277
 „ on habit, 266
 „ on walking, 172
 „ on complete living, 3
 Sprinting, 68
 Squatting, 252
 Stains, hair-, 151
 Staleness, 73
 Stamina, 64, 68
 Stapedius, muscle, 223
 Steaming the skin, 136
 "Stitch," 81
 Stopping, of teeth, 168
 Strain, 87
 Strapping the skin, 136
 Style, 253
 Sun-baths at Veldes, 191
 "Sun brothers," the, 106
 Sunburn, 140, 191
 Sunlight, 188

Sweat, 41, 100, 114
 Sweating-down, 67
 Sweaty feet, 181
 Swimming, 48, 94
 Synapses, 269-73

T

Tartar of teeth, 166
 Team play, 78
 Teeth, 158
 „ brush, 167
 „ carious, 159
 „ "comforter" and, 160, 161
 „ drill, 170
 „ "fits" and, 163
 „ powders for, 167
 Texture of clothes, 100
 Thieves, Pathan, 16
 Threats, the first sound of, 216-17
 Time factor, in work, 68
 Tiring of muscle and nerves, 88
 Tobacco on eyes, 209
 Tone, want of, 246
 Tooth-brush, 163
 Training, 69
 „ down, 71
 „ forced or temporary, 71
 Trousers, 113
 „ turned-up, brushing, 113
 Tuberculosis, ineradicable, 5
 „ fitness and, 8
 Turkish bath, the, 45
 Two-layered clothing, 100

U

Ullman on X-rays and hair, 152
 Unfitness, 6

V

Vapour bath, 46
 Varicose veins, 252

Vibrissae, 237
 Vision, 203
 „ distant and near, 203-4
 „ and eyes, 214
 „ mechanism of, 205
 Visits to doctor, 282; dentist, 168
 "Vital Tides," Wyllie, 26
 "Voices," 224

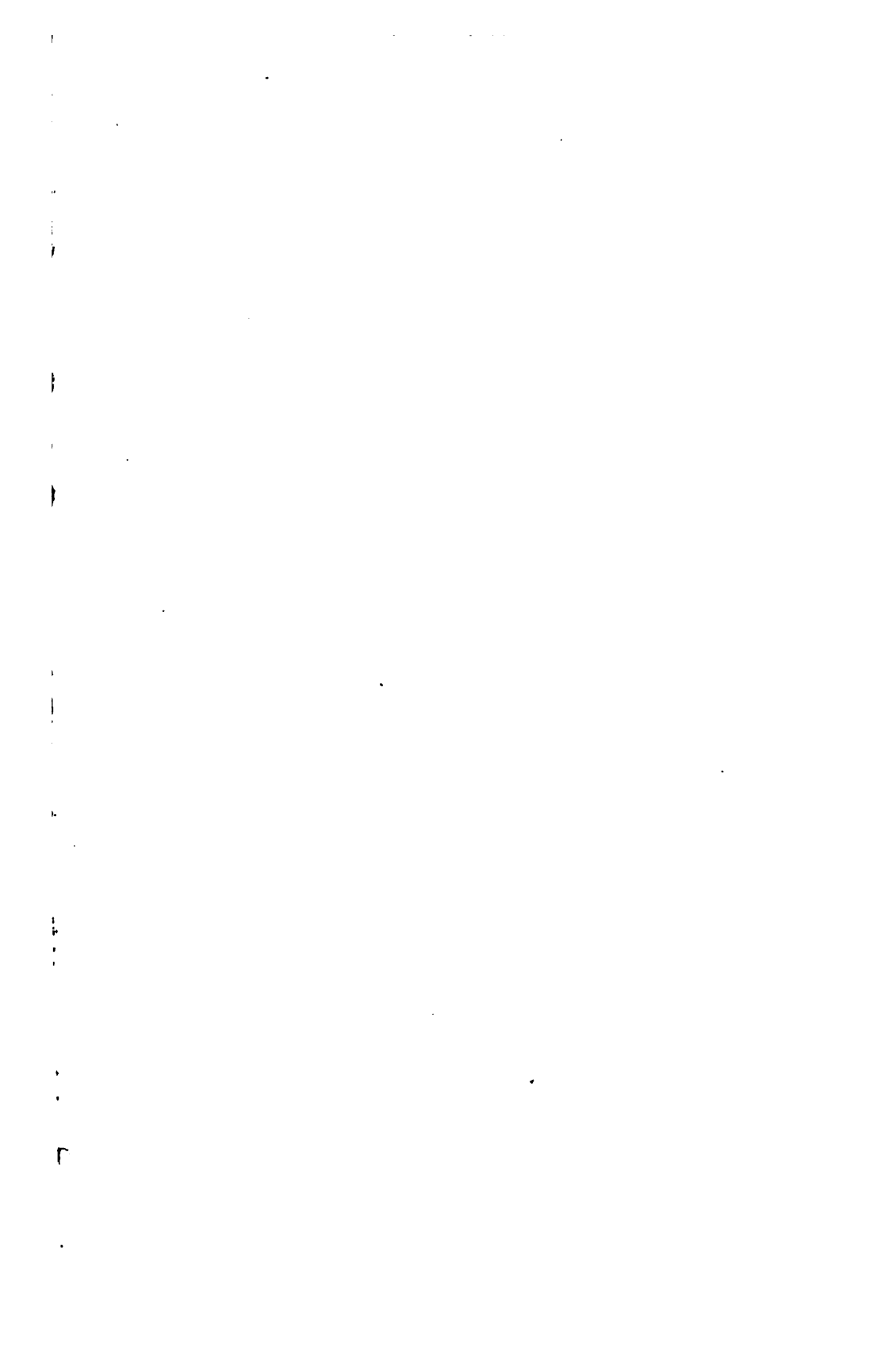
W

Waistcoats, 112
 Walker, Norman, on soap, 130
 Walking, 75
 „ normal, 173
 „ running and, 62
 „ towns and, 75
 „ results of, 81
 Warm bath, 33, 43
 Warts and moles, 141
 Washing, 127
 „ hair and, 152
 „ women's hair and, 156
 Water, soft, 127
 „ hard, 127
 „ running, 128
 Wax in ear, 227
 "Webbs" and "Dinnies" are born so,
 90
 Weichardt on fatigue, 87
 Weight-lifting, 64
 White shirt, the, 114
 Winking, 215
 „ quickest reflex is, 264
 Women, muscle of, 60
 „ exercise of, 80
 Worry, Spencer and, 135
 Wrinkles, 134
 Wundt on reflexes, 264

X

X-rays, 151, 191







This book should be returned to
the Library on or before the last date
stamped below.

A fine of five cents a day is incurred
by retaining it beyond the specified
time.

Please return promptly.

BOOK DUE WID

589-577
JAN 31 1978

BOOK DUE WID

5968630
JUL 14 1978